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BY

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A
T R E A T I S E
ON THE
THEORY AND PRACTICE
OF
S U R G E R Y.

CHAPTER XI.

Of the STONE.

SECTION I.

General Remarks on Urinary Calculi.

PARTICLES of stone have been known to form in almost every cavity of the body, but they are more frequently met with in the organs of urine than in other
Vol. II. B parts

parts. It is the effects which calculi produce in the urinary passages, with the means which have been found the safest and most effectual for removing them, that we are now to consider.

The blood, as well as the various secretions which it affords, are, by experiment, found to contain a considerable proportion of earth: When this earthy part of our fluids is in a proper or natural quantity, and when no cause occurs to effect a separation of it, it continues to circulate along with the other parts of which these fluids are composed; and in such a state it is never productive of any inconvenience. A variety of causes, however, may concur to produce a deposition of this earthy matter from the blood and its secretions.

1. We know, that every liquid can dissolve and keep suspended a certain quantity, and no more, of those substances of which it is the proper menstruum; and it is likewise known, when a greater proportion than this is added, that a separation and consequent deposition takes place of all the additional

additional quantity: In like manner, we may suppose, if the lacteal vessels ever become so diseased as to absorb a greater proportion of earthy matter from the contents of the intestines than the quantity of fluids in the circulating system can keep suspended, that this superabundance of earth must necessarily separate from the rest: And the depositions thus produced are much more likely to occur in the bladder and kidneys than in other parts, from the urine being known to contain a greater proportion of earth than any of the other secretions.

2. Independent of other causes which may tend to induce a superabundant quantity of earthy matter in the blood, such articles of diet as contain a large proportion of any kind of earth have been supposed to be more productive of it than others: But unless such quantities of earth as are contained in food, be conveyed in a state of the most perfect fluidity, any effect which this may produce on the general mass of blood, cannot probably be of much importance. There is much reason, however, to

think, that a long-continued use, either of water or of wines, abounding with earth in a dissolved state, has a considerable tendency to produce such a state of the blood as we are now describing.

3. People who are much accustomed to live upon solid food, will be more liable to the effects of a large proportion of earthy matter in the blood, than those who by a free use of liquids are in the habit of preserving a more plentiful and more diluted state of the different secretions. And, accordingly, in such patients as are frequently voiding particles of sand, and even of real calculi, I have known more advantages derived from a continued and plentiful use of diluent drinks, than from any other remedy. A liberal use of watery fluids may, no doubt, operate to much advantage, by washing away particles of sand and of stone already formed and lodged in some of the urinary passages; but they seem likewise to prove serviceable, merely by their diluent properties.

4. A superabundance of earthy matter
being

being once produced in the blood, various circumstances will concur to form depositions of it in the different cavities: Of these a sedentary life is, perhaps, one of the most remarkable; and hence it is, that such people are found to be most liable to calculous complaints, whose occupations require the least bodily exertion.

It must indeed be allowed, that stone in the bladder is frequently met with amongst indigent and industrious labourers; whose necessities, at all times, prevent their indulging in indolence. In such instances, however, it may be supposed, that the very coarse articles of food, with which people in this line of life are chiefly nourished, will tend to impregnate the blood with such a large proportion of earth, as must necessarily produce effects not to be obviated, even by the beneficial influence of a continued and regular course of exercise.

5. Whatever influence a predisposition in the system may have in the formation of calculus, and in its subsequent increase of bulk, the introduction of any substance

that can serve as a nucleus, will almost certainly produce a stone, in whatever cavity it is lodged. Thus, a particle of sand, of blood, or coagulable lymph, may, in consequence of spasm or inflammation, be confined in the pelvis of one of the kidneys, or in the cavity of the bladder, and may soon acquire such a size, from the constant addition of earthy matter it is receiving, as to make it impossible for the urine to carry it off: And urinary calculi, thus begun to be formed, will acquire, sooner or later, a considerable bulk, according to the quantity of earth with which the urine is impregnated. Thus instances have occurred of stones becoming very large, in the space of a few months from the first obvious symptoms produced by them; while, on other occasions, they have been known to remain in the bladder for a great many years, without arriving at any size of importance.

When speaking of nuclei, it is necessary to remark, that their effect in the formation of calculi, in the urinary passages especially, appears to be so great, that it
may

may be doubted whether a stone is ever known to form in these parts without the intervention of this cause ; for, however large the quantity of earth contained in urine may be, it would probably all flow off by the urethra, if it was not detained by the accidental introduction or formation of a nucleus.

Nuclei of different kinds, such as hairs, needles, musket and pistol bullets, pieces of bougies, and a variety of other articles, have been met with in the centre of urinary calculi ; but particles of blood, or of coagulable lymph, are most frequently found to produce them.

By the difference of food used at different periods of the disorder ; by the stone being formed slowly or more quickly ; and perhaps, by the intervention of other causes which are not always known, and which, when known, cannot be easily explained ; it commonly happens, that the different lamellæ of which human calculi are composed, vary considerably both in colour and consistence ; a crust of a soft

friable nature being frequently known to cover one of a texture equal in hardness to the most solid marble; while this again is found to surround a stratum not firmer than a piece of dough.

Whatever may be the immediate cause of this difference of consistence in stones, and even of different parts of the same stone, is of little importance in practice: But we know from experience, that the symptoms produced by calculi formed of hard compact materials, are in general more severe than such as arise from those of a softer texture; and we likewise know, that the surface of stones being smooth or ragged, has much more influence than any other circumstance in the violence of the symptoms which they produce: Much variety too, it may be remarked, is met with in human calculi with respect to the smoothness of their surfaces; some of them being perfectly polished, while others are altogether covered with hard sharp spicula.

The violence of symptoms in affections
of

of this nature, is frequently found to be in a great measure in proportion to the size of stones; stones of the greatest bulk being commonly attended with the most severe pain. This, however, is not universally the case; for instances sometimes occur of the most severe symptoms being induced by stones of no great bulk; whilst in others, stones of considerable magnitude have been known to subsist for a great length of time without being productive of much pain: But in general it is otherwise, and the symptoms which take place are most frequently mild or severe, according as the stone by which they are produced is small or large.

When a stone in the bladder has acquired such a size as prevents it from passing off by the urethra, the patient becomes liable to a set of symptoms which from their commencement are productive of much uneasiness, and which, in the event, commonly terminate in the most afflicting scenes of distress to which the human frame is liable. One of the first
symptoms

symptoms in this disorder, is an uneasy sensation at the extremity of the urethra, which for some time is only discovered on the patient taking violent and jolting exercise, or immediately after voiding urine. This pain by degrees becomes more frequent and more severe. The patient has a strong propensity to pass urine frequently, and commonly voids it in small quantities, perhaps even drop by drop.

When flowing in a full stream, it often stops suddenly; and this it is most apt to do when there is a considerable quantity of urine collected, and when of course the patient's desire for voiding it is strongest. Nor does the pressure usually employed on such occasions answer any good purpose: For, as the interruption to the flow of urine proceeds from the weight of the stone bearing against the neck of the bladder and orifice of the urethra, nothing will produce a free return of it but an alteration in the site of the stone, which will be most readily effected by the patient changing the posture of his body,
and

and particularly by the pelvis being more or less elevated.

The urine of calculous patients is sometimes perfectly clear, but most frequently it is thick, and deposits a mucous sediment, and on some occasions, when the disorder is violent, and when the paroxysms return frequently, it is tinged with blood. When the stone is large, a dull uneasy sensation is at all times experienced about the neck of the bladder; and the irritation produced by it frequently induces a very troublesome tenesmus, or a constant desire to evacuate the contents of the rectum.

All these symptoms are uniformly aggravated by exercise, particularly by riding on horseback; and from a long continuance of pain, and from that want of rest which frequent returns of the paroxysms are sure to induce, the patient's state of health by degrees becomes impaired; and unless some effectual means are now employed for removing the cause of the disorder, it commonly happens that his misery is only terminated by death.

When

When all or most of the symptoms we have enumerated occur in the same patient, there can be no great reason to doubt of the nature of the disorder; and we are rendered particularly certain of the existence of calculus, when fragments of stone, or perhaps when sundry small stones, continue to be passed from time to time along with the urine: But when this last circumstance does not occur, we can never know with certainty whether the attending symptoms originate from a stone or not; for instances frequently happen of all the symptoms usually produced by stone in the bladder, arising from an ulcer or tumor either in the body of that organ, or in its neck, or even from tumors on the contiguous parts which press upon the neck of the bladder.

A person much accustomed to this part of practice, will in general be able to determine from the symptoms which occur, whether a stone actually exists in the bladder or not; but the only certain means we have of judging of this matter is through
the

the intervention of a sound, or curved probe; different sizes of which are represented in Plate XII. By introducing this instrument into the bladder, in the manner we shall afterwards direct, if it touches a stone, such a sensation is thereby communicated to the operator, as renders the nature of the disease altogether certain; a circumstance of which we can never be clearly convinced by any other means.

Among other causes which concur to prevent any certainty from being obtained on this point, except from the test of sounding, is this: The very same set of symptoms with those produced by a stone in the bladder, frequently occur from a stone impacted in one of the ureters, or perhaps even in the pelvis of one of the kidneys. A stone in the kidney is commonly indeed attended with symptoms which do not often proceed from a stone in the bladder; particularly with pain in the back, frequent nausea, retching, and vomiting: But these do not always occur from calculi in these parts; and when
they

they do not, the other symptoms produced by them are frequently so similar to those which originate from a stone in the bladder, as to render it impossible to judge with certainty of the true nature of the disorder by any other means than by sounding.

SECTION II.

Of Sounding or Searching for the Stone.

IT will be proper, before describing the operation of sounding, to give an anatomical description of such parts as are concerned in it : And at the same time we shall exhibit an account of those parts that are most immediately affected by the various operations of lithotomy : These are, the kidneys, ureters, urinary bladder, pelvis, vesiculæ feminales and their ducts, prostate gland, urethra, penis, some of the muscles of the penis, and part of the abdominal muscles.

A minute description of these parts
would

would lead to an extensive discussion inconsistent with the nature of this undertaking; and as such a description is by no means essentially necessary, we will only endeavour to give such an idea of the situation of the parts, as will serve to render intelligible what may be said upon any of the operations of which we shall afterwards have occasion to treat.

The kidneys are two glandular bodies lying in the back-part of the abdomen, on the upper part of the psoæ muscles; the right being situated immediately below the great lobe of the liver, and the left under the spleen; and they are both, we may remark, almost completely covered by the slight curvatures of the inferior false ribs. They are supplied with blood-vessels, termed the Emulgent Arteries and Veins, directly from the trunks of the aorta and vena cava. The use of these organs is to separate the urine from the blood, which, as soon as it is secreted, is carried by means of two canals or tubes, one from each kidney, termed the Ureters, directly

directly to the vesica urinaria. The ureters, after leaving the kidneys, proceed obliquely downwards behind the spermatic vessels, over the os sacrum; and passing in between the bladder and rectum, they are inserted into the former near to its neck, at a small distance from one another; and after piercing the external coat of the bladder, they run obliquely for a short space between it and the more internal covering of that organ before penetrating its cavity: A construction well calculated for preventing a reflux of urine to the kidneys.

The pelvis is a kind of box or basin, formed by a conjunction of the os sacrum, os coccyx, and ossa innominata. The cavity formed by a particular combination of these parts, being intended for the protection of the bladder, and some other organs, is every where surrounded with bone, or with very strong ligaments, except at its upper and inferior parts, where alone the cavity of the pelvis is accessible, being here covered with soft parts only.

The

The greatest part of the cavity of the pelvis is occupied by the bladder, which, when distended with urine, fills it almost entirely, and on many occasions even ascends considerably above its brim.

The bladder, or receptacle of the urine, is a membranous bag composed of different coats, one of which is evidently muscular, with its fibres running in different directions. The human bladder is of an irregular oblong figure. The superior part of it has commonly been termed its Fundus, or Bottom: The opposite extremity lying at the bottom of the pelvis, is termed the Cervix or Neck; and the intermediate space, its Middle or Body. The bladder is every where nearly, though not exactly, of the same diameter, except at its fundus, where it is somewhat contracted; and again near to its neck, where it dilates considerably, extending back towards the coccyx.

The superior part of the bladder is covered with the peritonæum; and it therefore lies, along with the other abdominal

viscera, within the abdominal cavity ; but the under part of it is not covered with that membrane. The anterior under part of the bladder is connected by cellular substance to the pubes ; laterally, it is fixed by productions of its external covering to the other bones of the pelvis ; and posteriorly, it is in male subjects firmly connected with the rectum, from the entrance of that gut into the pelvis, till within a little of its termination in the anus, when the neck of the bladder and commencement of the urethra separate a little from the gut, leaving a space which is occupied with fat and cellular substance.

In females, the uterus, in an unimpregnated state, lies altogether in the cavity of the pelvis immediately behind the bladder ; and the vagina, in which the os tinæ terminates, lies directly behind the urethra, and before or upon the intestinum rectum, to which it is firmly attached.

The neck of the bladder terminates in the commencement of a cylindrical membranous

branous canal, the urethra, which comes off at nearly a right angle from the anterior part of it. The urethra, at its commencement, is furrounded by the prostate, a gland of a flat pyramidal shape, with its base towards the bladder, and its apex pointing to the perinæum; its superior lamella being connected with the pubes, and its inferior part with the anterior and under part of the rectum.

The urethra continues to be entirely membranous for a short space after it leaves the apex of the prostate gland; and this part of it keeps in close contact with the os pubis, till it passes out from below the arch formed by these bones, which it does by making a pretty sharp curve in its progress to the perinæum. This curvature in the urethra it is material to be well acquainted with, for in the operation of Sounding, a good deal depends upon this circumstance. A good anatomist in general finds the introduction of a staff very easily accomplished, while those who are not versant in the anatomy of the parts concerned,

are not only apt to fail entirely in attempts of this kind, but are sure to put their patients to a great deal of unnecessary pain.

The commencement of the urethra, which we have just described, is termed the Membranous part of it; which, before it has proceeded an inch from the extremity of the prostate gland, is surrounded by a cellular kind of body, termed the Corpus Spongiosum Urethræ, which here forms a kind of protuberance, termed the Bulb of the Urethra; and which afterwards proceeds along in a more diffused state to the extremity of the penis, where, by expanding again, it terminates in the formation of the Glans Penis.

The rest of the penis is formed of the Præputium, which, as we have elsewhere said *, is merely a doubling of the skin, and of two round cavernous bodies, termed the Corpora Cavernosa Penis, which originate by two crura or legs from part of the os ischium and posterior part of the pubes

on

* Chapter X. Section I.

on each side ; and having united near the symphysis pubis, they thus form the principal part of the body of the penis, and are continued to the glans, with which they are connected, but with which the cellular or cavernous parts of these bodies have no direct communication.

By the junction of the two cavernous parts of the penis, which are nearly round, a kind of hollow is formed both above and below. In the former of these, or in that vacuity which runs along the back part of the penis, the principal veins of the penis run ; and the urethra is protected by the latter. The obvious use of the urethra is to serve as a passage for the urine and semen ; the receptacle of the former we have already described, and we shall now mention those of the latter. The semen, after being secreted by the testes, is by two very small tubes termed *Vasa Deferentia*, lodged in the *vesiculæ seminales*, which are found to be two cellular kind of canals, contorted in such a manner as when distended

to resemble the intestines of a small fowl. They are seated on the posterior part of the neck of the bladder, below the entrance of the ureters, and lie in close contact with the rectum; and the semen is again discharged from these receptacles by two excretory ducts, which terminate in two points, at a part which, from its figure, has been termed the *Caput Gallinæ*, situated in the inferior side of the urethra, nearly about the middle of the prostate gland; and a little below the entrance of these canals from the *vesiculæ seminales*, the two excretory ducts of the prostate gland empty themselves into the urethra.

The muscles we have to mention here, as being liable to be injured by the operation of lithotomy, are the *erectores penis*, *acceleratores urinæ*, *transversales perinæi*, and *levator ani*. The *erector penis* arises from the tuberosity of the ischium; and, after covering almost completely the crus penis of the same side, it is inserted by a tendinous expansion into the superior part of
of

of the penis, near to where it joins with its fellow of the opposite side.

The accelerator urinæ arises by fleshy fibres from the sphincter ani and contiguous soft parts ; and after covering the membranous part of the urethra, it is inserted into the middle of the bulb, where it joins with a similar muscle of the opposite side : Part of these muscles, too, run along the crura penis, and are afterwards lost in the ligamentous covering of the corpora cavernosa. The transversales perinæi are two thin narrow muscles, which originate from the firm membranous covering of the tuberosity of the ischium, and, after stretching directly inwards, are inserted into the bulb of the urethra.

Besides these muscles, which all suffer more or less in the lateral operation of lithotomy, a few fibres of the levator ani are necessarily cut in the same operation ; and in the high operation for the stone, part of the musculus transversalis abdominis, of the rectus, and pyramidalis, are also cut.

Almost all the parts we have described are furnished with blood by branches from the internal iliac artery ; and those vessels which run most hazard of being cut in the lateral operation for the stone, are, the arteria pudica interna, and the pudica externa : For the former supplies not only the parts about the anus, but the bulb of the urethra and the corpora cavernosa ; and the latter, *viz.* the pudica externa, supplies a great part of the bladder, the prostate gland, and vesiculæ feminales.

Having thus premised all that is necessary for our purpose, of the anatomy of these parts, we shall now proceed to the operation of sounding.

For the purpose of discharging water collected in the bladder, a curved silver tube is made use of named a Catheter, different forms of which are delineated in Plates XIV. and XV. : But for the discovery of a stone in the bladder, a solid instrument made of steel is preferable, as the sensation communicated through the intervention of a firm substance is much more distinct than when
an

an instrument of silver, or of any other softer materials, is employed. In females, the urethra runs almost in a straight line; so that an instrument either altogether straight or nearly so, is more easily introduced than one with a large curvature: But in male subjects, the turn made by the urethra, when it passes up between the rectum and pubes, is so considerable as to preclude entirely the introduction of a straight instrument, unless much violence is used. By preserving the penis at an acute angle with the body, the course of the urethra may indeed be rendered so straight, that a straight probe may be easily introduced, till it reaches this turn towards the farther extremity of the perinæum; but the curvature made by the urethra at this place, renders it necessary to employ an instrument with a corresponding degree of convexity.

The curvatures commonly given to these instruments are either too great or not considerable enough. Either extreme renders it difficult to obtain a passage into the bladder: For when the staff is made with
more

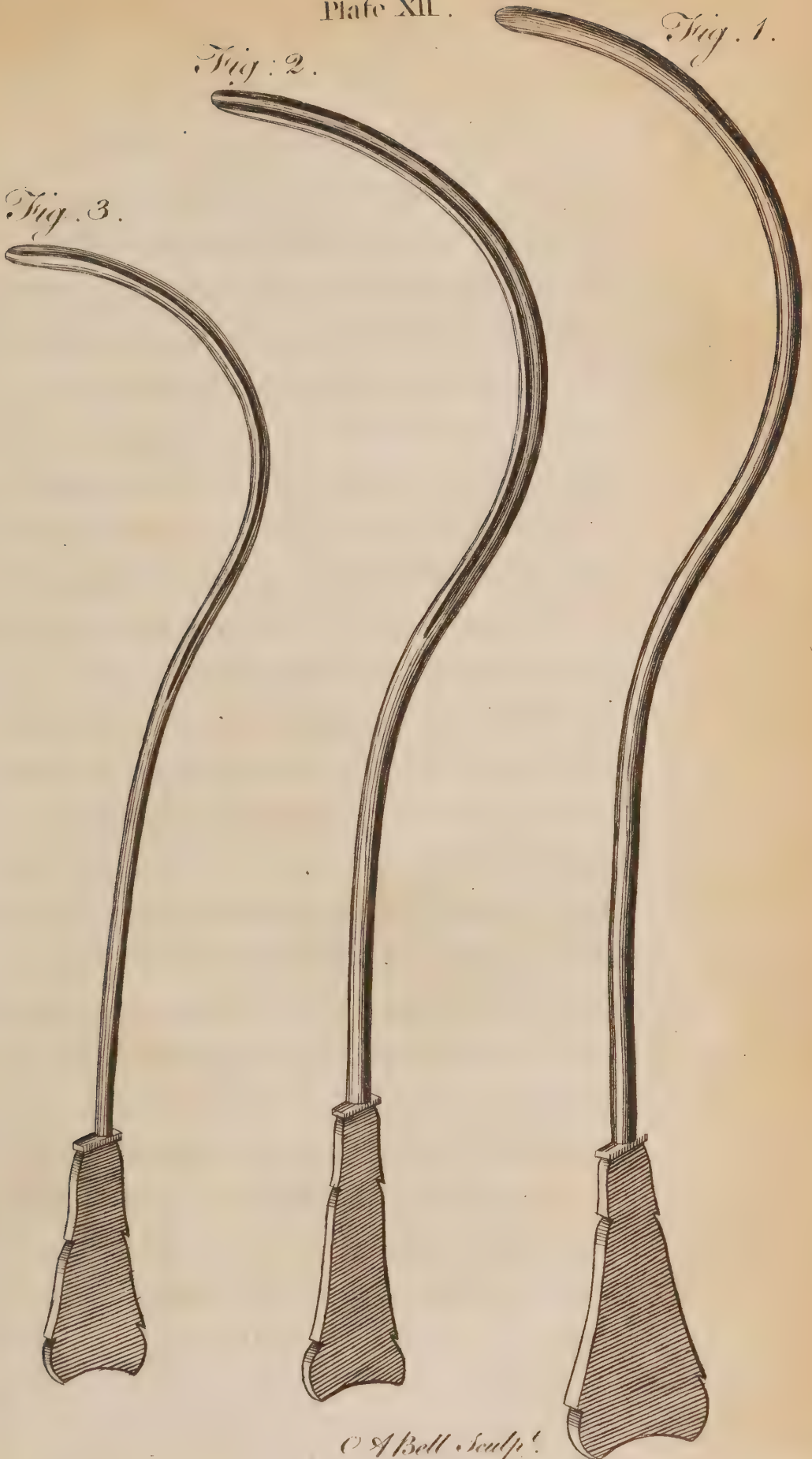
more convexity than is necessary, besides being more difficult to introduce, it gives a great deal of unnecessary pain, by stretching the urethra very considerably ; nor can such an instrument, with a large convexity, be so easily managed, when in the bladder, as when the curvature given to it is less. In Plate I. sounds of various sizes are represented, and of such degrees of curvature as by experience have been found to answer better than any other. They are taken exactly from the natural curvature of the urethra, the instruments from whence these are delineated having been exactly adapted to that passage, after the surrounding parts were dissected off.

The patient to be sounded should be laid upon a bed, with his head raised upon a pillow, and his thighs somewhat elevated and separated from one another ; and the surgeon being placed upon his left side ought to take a sound of a size proportioned to the passage intended to receive it : Having previously brought it to the heat of the patient's body by immersion in warm water, and having rubbed it over
with

Fig. 1.

Fig. 2.

Fig. 3.



with fine oil, he is now to grasp the penis with his left hand ; and, having introduced the point of the sound into the urethra, with its concave side towards the abdomen of the patient, he must push it easily forwards with his right hand, while at the same time he continues with his left hand to draw the penis gently forward upon the instrument.

The sound being in this manner carried a sufficient length, it will commonly slip easily into the bladder ; but, occasionally, some difficulty is experienced in passing it through that part of the urethra where it is surrounded by the prostate gland, the instrument being apt to stop when it comes to this part of the passage ; and whenever it does so, practitioners ought to be extremely cautious in the force they employ for carrying it on. That part of the urethra, immediately anterior to the prostate gland, being entirely membranous and unsupported, if the sound at this part meets with any obstruction, and if it is still pushed forward with any considerable

considerable force, much mischief will for certain be produced, by the point of the instrument being forced entirely through the urethra; by which, instead of getting into the bladder, it will form an artificial passage, either between the bladder and pubes, or between the bladder and rectum: An occurrence which is sure to be productive of much distress; and which, there is reason to fear, is, either from ignorance or inattention in practitioners, much more frequent than it ought to be.

In order to guard against the very dreadful consequences of such an occurrence, as soon as any obstruction is discovered to the passage of the instrument, the fore-finger of the left hand, after being well oiled, ought to be introduced into the rectum, which by elevating the point of the staff, while at the same time it is pushed gently forward, will commonly procure its ready entrance to the bladder when no other means have any effect. By depressing the handle of the sound, we may also elevate the point of it, and in this manner its entrance

trance into the bladder may be sometimes effected ; but in general the introduction of the finger into the rectum answers this purpose with much more certainty.

This passage of the staff into the bladder, it may be observed, is a very nice operation ; and a dexterity in performing it can be acquired in no other way than by a great deal of practice. Every student, therefore, ought to embrace all opportunities that occur of practising it, first on the dead subject, and afterwards on the living. For every candid practitioner must acknowledge, that he has, on different occasions, found the introduction of a catheter, or of a sound, to be a matter of much difficulty. But when the parts concerned are not materially affected with inflammation, swelling, or ulceration, the operation does not frequently misgive in the hands of an expert surgeon.

The staff being thus introduced into the bladder, the operator must now take hold of the handle of the instrument with one hand ; and if any part of it falls immediately

ately upon the stone, the business of sounding is at once accomplished, as a certainty is thus obtained of the nature of the disease: But if the stone is not soon discovered, it may commonly be found by moving the instrument, so as to make its point pass easily from one side of the bladder to the other. When the stone, however, is small, and has fallen into that part of the bladder which lies below the entrance of the urethra, the staff is very apt to pass over it entirely. With a view to obviate this difficulty, the finger of the left hand may be again introduced into the rectum, so as to elevate that part of the bladder in which the stone most probably lies concealed. If, again, even this attempt should be found to fail, the patient's body should be put into a different posture; and no situation will, in general, answer so effectually as lowering the head and upper part of the body, while at the same time the pelvis is considerably raised. By this means a stone, if it be not contained in a particular cyst, which it rarely is, may be moved from the
projection

projection at the neck of the bladder towards its fundus, where it will be more readily struck with the sound. But when, even by this posture of the body, we fail in obtaining a certainty with respect to the existence of a stone, every variety of position ought to be tried: The patient's head may be elevated, and the pelvis depressed; he may be made to stand erect; or, what I have sometimes known to succeed after other attempts had failed, he may be made to stand upon his feet, with his body as much bended forward as possible.

It sometimes, however, happens, when the stone is very small, and the capacity of the bladder is large, that our first attempt in sounding fails altogether; but when the symptoms of stone are strongly marked, and when schirrosity and ulceration of the parts, which might give rise to these symptoms, are not found to exist, we ought not to rest satisfied with one, or even with two trials. I have known a stone discovered on the third or fourth sounding, which
had

had escaped the instrument in all the preceding trials.

When a stone is struck by the staff, the sensation it communicates to the operator is of such a particular nature, as to render it impossible for any person versant in matters of this kind to be deceived by it, if he attends sufficiently to the business he is about: But, to those not much accustomed to this part of practice, a hardened state of the bladder itself communicates such a sensation through the staff, as frequently proves the cause of most unfortunate deceptions. Occurrences of this kind have even happened to practitioners of much experience: It is reported of the most celebrated lithotomist of this, or perhaps any other country, that in the course of his practice, which indeed was very extensive, three patients were cut by him in whom no stones were discovered, and where a schirrous or hardened state of the bladder had given rise to the mistake *. With practitioners of experience, however, this
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* The late Mr Cheselden.

can never happen but from gross inattention; for I will venture to affirm, that a person who is once accustomed to know the nature of that sensation communicated by a stone, can never, if he attends properly to what he is doing, be deceived by the application of the sound to a schirrus or any other tumor.

There being the least hazard, however, of such a misfortune occurring as the one we have mentioned, namely that of a patient being made to undergo all the pain and risk attending the operation of lithotomy, when no stone has existed, is a matter of such a serious nature, as ought to render every practitioner exceedingly attentive to this part of the operation.

SECTION III.

General Remarks on the Operation of Lithotomy.

THE presence of a stone in the bladder being ascertained in the manner we have mentioned, the means to be employed

for the patient's relief is the next object of consideration.

At a certain period, the public were much amused with high encomiums on the lithontriptic powers of different articles, particularly of lime-water, and of caustic alkali in a diluted state. But although some human calculi are soluble in either of these liquids, particularly in the latter when directly immersed in it, yet neither of them can be conveyed in such a state to the bladder as to be much depended on. Many patients, indeed, have experienced some relief from the use of these remedies: The pain has, by their means, been rendered somewhat less severe, and the paroxysms have apparently been rendered less frequent; but we have not one authenticated instance of a stone in the bladder being dissolved by the use of these, or of any remedy whatever.

As the constituent principles of these and other lithontriptic medicines, render them liable to very material changes in their passage through the circulation from
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the stomach to the bladder, it has been proposed to convey remedies of this class directly into the bladder itself, in order to bring them into immediate contact with the stone ; and machines have, accordingly, been invented for injecting with facility such medicines of this kind as are supposed to prove most effectual : But, after a great many trials have been made of remedies of this nature, it seems now to be universally allowed among practitioners, that no solvent, powerful enough to have any effect upon a stone, can be injected into the bladder, but with the greatest hazard of injuring that organ in a very material manner. But as some practitioners still continue to think favourably of this practice, we have given a delineation, in Plate XX. of a machine by which liquids may with great ease be injected into the bladder. Every attempt, however, of this kind is now in general laid aside ; and as no dependence is to be placed upon the lithontriptic powers of any medicine taken by the mouth, the only resource we have is,

the removal of the stone by a surgical operation. By this means, if the patient's constitution is not much impaired, he may again enjoy as good health as he did previous to the appearance of the disorder. And unless the operation be submitted to, it is almost certain that the remainder of a miserable life will be cut short by the frequent returns of pain and fever to which people in this situation are constantly liable.

It is to be remembered, however, that although a great proportion of those who are cut for the stone recover and do well, yet a considerable degree of danger always attends the operation; so that, before advising any person to submit to it, such circumstances ought to be considered with attention as can best enable us to form a just prognosis of the event.

By experience it is found, that children more readily recover from this operation than adults; and it is likewise observed, that old people, from the fifty-fifth to the seventieth year, whose constitutions have not been much broke, run less risk from it
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than men in the full vigour of life. This difference may possibly arise from the inflammatory symptoms, which usually succeed to this operation, being more apt to proceed to a dangerous length in young plethoric people than in older patients; and we know from experience, that more danger is to be dreaded from the effects of inflammation after this operation, than from any other cause. But at whatever period of life the patient may be, if he is otherwise in good health, more success is to be expected from the operation, than if his constitution had been previously impaired by frequent returns of the disorder; and this especially if the disease should have continued so long as to produce ulceration in any part of the bladder.

In such a diseased state of the bladder as ulceration commonly induces, if the patient is far advanced in years, he could not expect much enjoyment of life, even although he should recover from the operation: In these circumstances, therefore, a prudent practitioner would rather decline to operate; and instead of this, he

would advise a plentiful use of mucilaginous drinks ; the use of the warm bath ; together with doses of opiates proportioned to the degree of pain. By these means the violence of the disorder is sometimes mitigated, and the patient is thereby saved from the distress of a severe operation, the effects of which, in a constitution such as we have mentioned, are frequently found to prove fatal.

But even in these circumstances, if the patient is at an early period of life ; if he is suffering much from the disorder ; and if he is not so weak as to render it probable that the quantity of blood usually lost in the operation may prove destructive to him ; I would be clear and decided in advising the operation. His chance of recovery will, undoubtedly, be less than if his health had been otherwise unimpaired ; but, if he is lucky enough to survive the operation, he may enjoy life with comfort and ease.

When it is once determined to have recourse to the operation of extracting the stone, the next point of importance is the
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best method of effecting it. From the anatomical description we have given of the parts with which the human bladder is surrounded, it is evident, that there are only two parts of it which can with any propriety be laid open for this purpose. A considerable part of the fundus of the bladder we have shown to be covered with the peritonæum; so that to open it here would be attended with imminent danger, from the certainty of exposing the abdominal viscera, not only to the effects of the external atmosphere, but to the irritation of the urine evacuated into the cavity of the peritonæum from the wound in the bladder. The posterior part of the bladder we have shown to be either immediately covered with bone, or internally connected with parts which it would be highly improper to injure; and these particularly are, the rectum, the vesiculæ seminales, with the vasa deferentia and ureters.

The only parts of the bladder, therefore, which we can with propriety cut into, are,

that portion of the anterior part of it, which lies immediately below the peritonæum, and which, when in a state of distention, is raised somewhat above the pubes ; where an incision directly above the brim of the pelvis will lay that part of it bare where it is not covered by the peritonæum, and where accordingly an opening into it is commonly practicable : And, again, that portion of the bladder we have termed its neck, which may be opened laterally by an incision in the perinæum, without any danger of wounding other parts of importance.

It is in one or other of these parts that any opening into the bladder can be made with safety. Some practitioners, indeed, have attempted to cut into it at the posterior part of its neck, or even into the body of it at once ; but the hazard of wounding parts of much importance is here so great, that for this and other reasons which we shall afterwards mention, every operation of this kind is now laid aside. We shall presently, however, enter more fully into the
discussion

discussion of this point, by giving a detail of the various means which have been proposed, from the time of Celsus downwards, for the purpose of extracting stones from the bladder ; and this we shall do in the order of time these different operations were introduced into practice.

The distress and misery occasioned by urinary calculi were probably experienced in the earliest ages of the world. Relief, we may therefore suppose, would be sought for, by the removal of the stones, as soon as such a sufficient knowledge of anatomy was obtained as could render attempts of this kind practicable. Accordingly we find, from the writings of Hippocrates, that even at this early period, the operation for the stone was frequently performed ; but as this branch of business was then solely practised by a particular set of men termed Lithotomists, no account is transmitted to us by this author of their method of performing it. Celsus is the first who describes the method of operating at the time when he lived ; and it consisted in an opening being made

made in the body of the bladder, directly upon the stone itself. From the small number of instruments used in this method of cutting, it has been termed the operation by the Lesser Apparatus.

SECTION IV.

Of the Operation of Lithotomy by the Lesser Apparatus.

THE person to be cut being properly secured, the easiest and best method of effecting which we shall describe when speaking of the lateral operation, the surgeon is then to dip the fore and middle fingers of his left hand in oil; and having introduced them into the anus of the patient, he is to search for the stone, and to push it forward towards the perinæum, directly below the pubes. In order to facilitate this part of the operation so as to get the stone properly fixed, the surgeon ought to press with his right hand upon the under part of the abdomen, at the same time that he is pushing the stone forward
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with his fingers in the rectum. By this means the stone is to be pressed forward below the pubes, and is to be secured upon one side of the perinæum, between these bones and the anus. This being done, we are directed by Celsus to make a semilunar cut through the skin, cellular substance, and muscles ; beginning on one side of the anus, and carrying the cut directly over the centre of the tumor formed by the projection of the stone. The bladder being thus laid bare, a transverse incision is ordered to be made through the coats of it directly upon the stone ; when the stone, if it is a small one, may probably be turned out by the fingers in the rectum pressing upon it from behind ; but if it is large, and if it does not come away easily, we are desired by Celsus to take the assistance of a hook for scooping it out.

This operation, with a few variations, continued, so far as we know, to be the only method of cutting for the stone, till the beginning of the fifteenth century, when another method of operating was introduced,

duced, which we shall afterwards relate particularly. Long after this period, however, this operation of Celsus was still continued by many regular practitioners ; and the ease with which it is accomplished, not only from the small number of instruments necessary for doing it, but from little or no anatomical knowledge being requisite, preserved it in constant use with Itinerants, who continued, even to a very late period, to practise it in different parts of Europe, under the name of the Operation upon the Gripe.

This method of cutting for the stone is indeed so easily effected, particularly in young subjects, that, even in these times, many of our well informed practitioners have a strong partiality towards it. At so late a period as the time of Heister we find it was much in repute, that practitioner himself having been in the habit of performing it frequently. But surgeons in general have been much deceived with respect to the parts injured by this operation : For it has been commonly supposed, that

that by cutting directly upon the stone, the bladder itself must alone be wounded, while all the neighbouring parts of importance are imagined to escape unhurt; a circumstance which would undoubtedly prove a strong recommendation of it, if on experience this was found to be the case: This, however, is far from being so, as any person who will make the experiment will readily perceive.

A strict attention to the anatomy of the parts, might at once indeed convince us of the difficulty, if not of the absolute impossibility, of cutting from the perinæum directly upon a stone in the bladder, without destroying either the vasa deferentia, the vesiculæ seminales, or the excretory ducts of those receptacles; the destruction of any of which would accomplish the effects of castration with as much certainty as a total extirpation of the testes themselves. These parts we have shewn to be all placed upon the under and back part of the bladder; and as they, as well as the ureters, are immediately connected with
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that part of it which is cut in this operation, it is perhaps impossible to perform it without dividing one or other of them.

As I had once a favourable opinion of this operation, I thought that on many occasions it might be usefully employed, if on experience it should be found that these parts could be avoided by the scalpel. I accordingly put it frequently in practice on dead subjects ; but although in all of them it was done with every possible attention, it was constantly found either that the *vesiculæ feminales* were divided, or that their excretory ducts were cut across. This, however, was not all ; for although in some instances the urethra was not touched, yet in others it was found to be completely laid open before the scalpel reached the bladder. In every instance where the operation is performed in the manner directed by Celsus, this circumstance of injuring the urethra before opening the bladder, is what must unavoidably happen : For it is altogether impracticable to make a transverse incision here into the bladder, as is
advised

advised by that author, without previously passing through part of the urethra ; that canal at its farthest extremity being always pushed forward by the fingers in the rectum, in such a manner as to render it impossible to avoid it in this method of performing the operation.

But in most of the trials of this kind which I had occasion to make upon dead subjects, I attempted what I should consider as a very material improvement of Celsus's method. A transverse or semilunar incision through the teguments and muscles I believe to be better adapted than any other for giving a free passage to the stone ; but as the bladder is composed of a very dilatable membranous substance, there is no necessity for a transverse incision being made into it. After laying the bladder bare, therefore, by a semicircular cut along the course of the stone, instead of continuing the same kind of incision with which the operation commenced, a longitudinal wound was made directly on the centre of the stone, in order to avoid
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with as much certainty as possible all those parts which ought not to be injured. Even with this precaution, however, although the urethra was avoided, some of the other parts we have mentioned were always found to be divided ; so that although they may by accident, perhaps, be avoided once in a great number of instances, I am confident that even the most expert anatomist would very seldom be able to make an opening into this part of the bladder sufficient for extracting a stone even of a very moderate size, without dividing either the *vesiculæ feminales*, the *vasa deferentia*, or their excretory ducts. In some instances, too, the entrance of the ureters into the bladder is so low down as to render them liable to be injured by this operation : This, however, is a rare occurrence ; but it has on some occasions been known to happen.

Another very material objection to this operation is, that the bladder when cut, being pushed forward and divided at a part which must afterwards recede from
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the external wound in the teguments, considerable risk must be thereby incurred of sinuses forming, by the urine insinuating into the neighbouring parts; and we have to add to all this, that in general this operation must be confined to the early periods of infancy. The readings of Celsus with which we are furnished, limits the performance of this operation to the age of ten, or from that to the fourteenth year; but this must surely be considered as an error in the late editions of that work, as the operation of which we are now speaking is unquestionably better calculated for the earliest periods of infancy than for the more advanced stages of it, insomuch that it is always practicable with more or less ease, in proportion to the thickness of parts about the rectum and bladder; and this, again, we know depends in a great measure upon the age of the patient. We are told, indeed, of some practitioners who performed this operation on people of every age, of every habit of body, and whether corpulent or not: Such accounts,

however, have never been well authenticated.

Among other improvements of this operation of Celsus, the use of forceps for extracting the stone was none of the most inconsiderable ; but neither this, nor any other advantage it can receive, is capable of obviating the difficulties we have mentioned. We find accordingly, that, about the beginning of the 16th century, some time between the year 1500 and 1520, a new method of operating for the stone was proposed at Rome by Johannes de Romanis, as we are afterwards informed by one of his pupils, Marianus, and whose name has been commonly given to it ; this being termed the *Methodus Mariana*, or *Lithotomy by the greater Apparatus*, from the great number of instruments which on its first introduction were employed in it.

SECTION V.

Of Lithotomy by the Greater Apparatus.

BY this operation a passage is made into the bladder, by cutting into the urethra.

thra immediately at the bulb; and at this opening a variety of instruments were by ancient writers proposed to be introduced, for the purpose of dilating the passage to such a size as might easily admit of the extraction of the stone.

From the period at which this operation was introduced, a number of inventions were proposed at different times, for the sole purpose of rendering the dilatation of the urethra and adjacent parts more easy. These it is unnecessary to enumerate, as an account of the operation as it was last practised in its most improved state, will serve to communicate all that is necessary to be known concerning it.

The patient being properly secured, and placed upon a table in the manner we shall describe more particularly when treating of the lateral operation, a grooved staff was then introduced through the urethra into the bladder; the handle of the instrument being carried over the right groin, while its convex part was made to push out the urethra on the left side of the pe-

rinæum. In this position the staff was preserved by an assistant, who likewise suspended the scrotum ; while the operator, with a scalpel in his right-hand, made an incision from the very bottom of the scrotum to within a finger's breadth of the anus, carrying it all along the left-side of the perinæum, within a very little of the rapha.

The skin, cellular substance, and muscles, being thus divided, the urethra itself was now opened at its bulb, by turning the back-part of the knife towards the rectum, and cutting with the edge of it directly into the groove of the staff; and the incision was then completed by carrying it along to the extremity of the urethra, at the commencement of the prostate gland.

Various instruments were at one period in use, termed Dilators, Male and Female Conductors, &c. &c. for the purpose of finishing the operation, by dilating such parts as we have not here directed to be cut ; and the timidity of some operators

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was even so great as to cause them to dilate almost all that part of the urethra which lies between the bulb and the prostate gland: A degree of caution by no means necessary, and which, by the violence done to the parts, was sure to be productive of many disagreeable consequences. Other practitioners, however, performing the operation so far in the manner we have mentioned, finished the remainder of it, first, by introducing a blunt gorget into the bladder, by running its beak along the groove of the staff, and afterwards pushing it forward so as to force a passage through the prostate gland; and this being accomplished, the fore-finger of the left-hand was introduced along the gorget, and with it the passage was farther dilated, till the operator thought the opening was sufficiently large for the stone to pass through it.

The opening being in this manner finished, the stone was extracted in the manner we shall afterwards direct when treating of the lateral operation, by the

use of different forceps adapted to the size of the parts : And in the extraction of the stone, all those parts which were not cut in the various steps of the operation, were of necessity very much lacerated.

Although this operation was long practised, it is liable to many objections. The number of instruments used in it is mentioned as one of these : But in the improved state of the operation we have described, this objection is entirely removed, no more instruments being used in it than are necessary in the most simple method of performing the lateral operation ; namely, a scalpel, gorget, and forceps for extracting the stone. But the material objections to which it is liable, are, that by beginning the incision so near to the scrotum, much more of the urethra is cut than is necessary : By not dividing the prostate gland with a cutting instrument, such laceration is produced, first by the forcible introduction of the blunt gorget, and then by the extraction of the stone, as must be the cause of much irreparable mischief : And lastly,

lastly, by the parts not being so freely divided as they ought to be, it must frequently be impossible to extract large stones by this operation, which, in the lateral method, as it is now practised, would pass with tolerable ease. In other respects, however, this operation was possessed of much merit, and it required only to be improved in a few circumstances to become the real lateral operation of modern practitioners. These, however, it is unnecessary to dwell longer upon at present, as they will be afterwards particularly taken notice of when we come to treat of that operation.

After this operation had been practised for thirty or forty years, some of the inconveniences attending it suggested the idea of what was afterwards termed the High Operation; an appellation it received from the bladder being cut into above the ossa pubis.

About the year 1561, Franco, a French surgeon of this name, published a treatise on herniæ*; and here we find the first ac-

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* *Traité tres ample des Hernies, par Pierre Franco.*

count of the high operation that is to be met with in books. It was accident which suggested it to Franco; for having, as he informs us, met with a large stone in a child of two years of age, which he could not possibly extract by the operation as then practised in the perinæum, he was induced to open the bladder above the pubes: But although the stone was extracted and the child recovered, Franco never performed the operation again himself; and he even advises it never to be attempted by others, from the great danger which he thinks will attend it.

The next account which we find given of it is by Rossét, in a publication on this and some other subjects, published at Paris in the year 1590. But it does not appear that he ever performed the operation himself; nor was it any where much practised till some time after the commencement of the present century, when it was adopted and keenly patronised at London by Mr Cheselden and Mr Douglas.

During the twelve or fifteen years immediately

mediately subsequent to the year 1720, the high operation was frequently performed both in London, Edinburgh, and other parts of Europe ; but the lateral operation, with the improvements upon it by Rau, being then more generally known, the superior advantages it was found to possess very quickly procured it a preference ; and since this period the high operation has never been generally practised, either in this or in any other country. But we shall now proceed to describe the method of performing it.

SECTION VI.

Of the High Operation for the Stone.

WE have already shown, that the bladder, at its fundus, or that part of it which lies highest in the pelvis, is covered with the peritonæum ; so that at this part no opening, it is evident, can be made into it with safety, as the operator would not only run the risk of wounding the intestines,

stines, but the urine would be apt to escape into the cavity of the abdomen. It is the anterior part of the bladder, *viz.* that space lying between the middle of this viscus and its neck, which ought to be opened in this operation: but this part of the bladder is seldom sufficiently elevated for this purpose, unless when it is considerably distended; and as one common effect of the stone in the bladder is to produce a diminished contracted state of it, this circumstance of itself is not an unfrequent objection to this operation; for unless the bladder is capable of containing a considerable quantity, at least a pound and a half in an adult, it ought seldom, if ever, to be attempted.

Various methods have been contrived for the purpose of distending the bladder. It has been proposed to effect it by means of air thrown into it from a pair of bellows; and others have recommended a quantity of water to be injected into it immediately before the operation, and to retain it there by making a ligature upon the penis. Both of these methods, however, will incur

cur some risk of hurting the bladder by too sudden distention; and we are even told by some writers, that the bladder has been burst by attempts of this kind. Means, therefore, of a more harmless nature should be attempted; and it may be done, I think, without running any risk of injuring the bladder, merely by desiring the patient to accustom himself, for a considerable time before the operation, to retain his urine as long as possible; and as soon as it is found that he can retain the quantity that is thought necessary, *viz.* a pound and a half in an adult, and so in proportion according to the age, by passing a ligature upon the penis ten or twelve hours before the operation, and ordering him to drink plentifully of any diluent drink, we may be almost certain of producing a sufficient degree of distention.

This being done, the patient must be laid upon a firm table about three feet four inches in height; at the same time, that his legs and arms must be properly secured, not by ligatures, but by the hands of assistants

sistants. In order to guard as much as possible against any injury being done to the bowels, the patient ought to be laid with his head considerably lower than his body, and his thighs and buttocks a good deal elevated. By this situation, too, the stone, which would otherwise fall into the neck of the bladder, where it could not be very accessible, will be brought more contiguous to the intended opening, and will hence be more easily laid hold of, either with forceps or the fingers.

The patient being thus properly secured, an incision is to be made with a round-edged scalpel, directly upon one side of the linea alba, beginning about four inches above the ossa pubis, and continuing it down to the symphysis of these bones: Even the linea alba itself may be divided with safety; but it is better to avoid it, as the incision is much more easily made in soft parts than in tendinous ligamentous substances. The skin and cellular substance being freely divided, the recti and pyramidales muscles come successively

sively into view: In general, the incision may be carried on merely by separating these muscles from one another; but no detriment could ensue from some of their fibres being cut by the scalpel.

A sufficient opening of the external parts being thus obtained, the operator is now to search with his fingers for the bladder, which he will commonly be sure to discover immediately above the pubes. With the fingers of his left-hand he ought now to press back the peritonæum, with the intestines contained in it, and with the same scalpel with which the preceding steps of the operation were effected, he is to penetrate the bladder itself at its most prominent part. This opening into the bladder ought at once to be made so large as to receive the two fore-fingers of the operator's left-hand; which being introduced, the incision is to be enlarged to the length of about three inches, by running a probe-pointed bistoury along one of the fingers down towards one side of the neck of the bladder. The instant that the fingers are introduced

introduced into the bladder, the ligature upon the penis should be taken off, so as to admit of the water contained in it being evacuated by the urethra, otherwise the whole of it will be immediately discharged by the wound.

The incision being completed in the manner we have directed, the operator ought to search with his fingers for the stone, and if possible, should extract it without the assistance of any instrument: But if this is found to be impracticable, the forceps must, no doubt, be employed. One great advantage attending this operation is, that as very little force is necessary for extracting the stone, so it is here rarely known to break: But when this misfortune occurs, the pieces will be more easily removed by the fingers alone, than with any of the scoops commonly employed. The stones being removed, the superior part of the wound in the teguments ought to be drawn together, either by means of strong adhesive plasters, or by the twisted suture, care being taken to leave at least an
inch

inch and half in the under part of it open, in order to evacuate any urine that may be thrown out from the wound in the bladder into the contiguous parts. It might even be proper to keep the whole external incision open till the wound in the bladder is reunited; but as the bowels, supported now by the peritonæum only, would be apt to protrude at this opening, and as such an occurrence would prove not only troublesome but even dangerous, it ought to be guarded against as much as possible.

With this view the bowels should be kept open with gentle laxatives, and the patient during the whole cure ought to be kept with his head and upper part of the body considerably lower than the pelvis.

The parts cut in this operation are not any where nearly surrounded with bone; on this account large stones can be extracted with more ease by this than by any other method: And as the wound in the bladder is made at a distance from its neck, fistulous openings are not so apt to ensue

enfue from it as from incisions made in the perinæum. These are two advantages which attend this mode of operating; but the objections to it are various.

1. When it is found that the bladder cannot admit of such distention as to be elevated above the ossa pubis, it is almost impossible to make an opening into it without dividing the peritonæum. Much danger must undoubtedly be the consequence of this, from the protrusion of the bowels, which will probably occur, from the access which is given to the external air, and from the urine escaping into the cavity of the abdomen.

We are informed, indeed, by writers on this subject, of a protrusion of part of the bowels having sometimes happened in the high operation, without any bad consequences being induced by it; the wounds being found to cure, and the patients afterwards to do as well as if no such occurrence had happened. Such favourable terminations, however, of accidents of this kind could not probably be frequent;
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and this is, accordingly, a very strong objection to the high operation.

2. After the high operation, and during the whole course of the cure, the urine, in many instances, passes readily by the urethra; but it happens not unfrequently, from inflammation about the neck of the bladder, as well as from other causes, that the natural course of the urine is obstructed. In these instances, from the wound in this operation being made in the anterior part of the bladder, the urine is very apt to be diffused in the cellular substance between the peritonæum and abdominal muscles, and between the bladder and pubes; and as no proper vent can be procured for it, sinuses are frequently produced, which always terminate in much distress.

3. It has been observed, whenever the patient's habit of body is not altogether good, that it is almost impossible to obtain a cure either of the wound of the bladder, or of the external teguments. This, it will be said, may be alleged as an objection to

every operation of importance: But altho', in every other method of performing the operation of lithotomy, the wound both of the bladder and of the more external parts heals more easily in some constitutions than in others; yet from all the writings we have on this subject it is clear, that any depravity of constitution is, in this respect, always productive of much more distress, after the high operation, than what commonly occurs from the same cause in the usual method of operating *in perinæo*.

4. This operation is confined almost solely to patients below thirty years of age: For although it was frequently practised on older people, and although no particular reason can be given why it ought not to succeed in more advanced ages, yet we learn from almost every author who has wrote upon it, particularly from Middleton, Smith, Douglas, and Heister, that a very small proportion only recovered of such as were above their thirtieth year.

It is perhaps for one or other of these reasons that the high operation has fallen
so

so generally into disuse, and that it has not been much practised for a great length of time in almost any part of Europe. But although this method of operating is attended with hazard, and is frequently followed with inconveniences; yet there is reason to think, that, in some instances, it might be practised with advantage.

The most material objection to the modern, or lateral method of cutting for the stone, arises from the bruising of the soft parts against the contiguous bones in the extraction of a large stone; which is so much the case, that we may consider the risk from the lateral operation to be almost in proportion to the size of the stone. When a stone is small and is easily extracted, the proportion of deaths in the lateral operation is very small: But whenever a stone is of such a size as to weigh seven, eight, or ten ounces, this operation perhaps is one of the most dangerous to which a patient can submit. Different instances have occurred, too, where the stone has been so very large, as to render its extraction by the

lateral operation impracticable, by all the force that could be applied; and some cases are on record in which there was a necessity of having recourse to the high operation, after the operator had failed in extracting the stone by the usual method of cutting in the perinæum *.

When, therefore, from the long continuance of the disease; from the sense of weight about the neck of the bladder; and particularly from the touch by the finger *in ano*, we have reason to suspect the stone to be of a large size, it ought to be an object of consideration, how far it may be proper to avoid the lateral, and, in certain circumstances, to employ the high operation. The circumstances we allude to respect the age of the patient, the soundness of his constitution, and the possibility of distending the bladder so as to raise it above the brim of the pelvis. These circumstances may

* This disagreeable occurrence, we find, happened to Heister. Vid. Heister's Surgery, p. ii. sect. v. chap. cxlii.

may be favourable where the stone is of a large size ; and when it is found to be so, the high operation, although less advantageous in the general run of calculous cases than the lateral method of cutting, may be practised with a greater probability of success than any other with which we are acquainted.

Having now said all that is necessary respecting the *Apparatus Altus*, we shall proceed to the consideration of what has usually been termed the Lateral Operation.

SECTION VII.

Of the Lateral Operation.

IN the operation of lithotomy, as it was formerly practised by the great apparatus, the external incision was made in nearly the same part that it is now in the lateral operation ; but the two methods of operating differ materially in every other circumstance.

The original invention of the lateral

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operation

operation is due to a French Ecclesiastic, commonly known by the name of *Frere Jacques*. This operator first appeared at Paris in the year 1697, when, by the successful event of a few cases, he was allowed to operate upon a great number. But it soon appeared to practitioners of discernment, that the fame he had acquired would not probably be of long duration. For with a very imperfect knowledge of the anatomy of the parts concerned in the operation, a bad assortment of instruments, and a total neglect of his patients after the operation, it was almost impossible that much success could result from his method. His manner of operating was as follows.

The patient being properly secured, either upon a table or upon a bed, a common solid staff was introduced into the bladder by the urethra, and the handle of it being carried over the right groin, the convex part of it was made to elevate the teguments and other parts on the left-side of the perinæum.

With a straight bistoury he now made
an

an incision through the skin and cellular substance, beginning between the anus and the tuberosity of the ischium, and continuing it upwards along the left-side of the perinæum, at a small distance from the rapha, till it extended at least one-half of the course of the perinæum. With the same knife he now went on along the direction of the staff, to divide the parts between the external incision and the bladder, which he also opened with the point of this very knife with which the other steps of the operation had been executed. At this opening in the bladder he first introduced the index of his left hand, in order to discover the situation of the stone; and having withdrawn the staff, he laid hold of the stone with a pair of forceps, and extracted it in the usual manner. The patient was now carried to bed, and no farther attention was paid to him by the operator, who never applied any dressings, as he trusted the subsequent management of every case to the nurse or other attendants.

In consequence of this unpardonable negligence, and by his frequently cutting parts in the course of the operation which ought to have been avoided, a great proportion of those he operated upon died ; no less, we are informed, than twenty-five of sixty *. Hence Jacques soon fell into disrepute ; and although he afterwards introduced considerable improvements in his method of proceeding, particularly in being more attentive to the subsequent management of his patients, and in using a grooved staff instead of a solid one, yet his reputation in Paris never again gained ground ; nor do we find that his method was ever attended with much success, either in Holland, or in the various parts of Germany where he afterwards practised.

For with so much inattention did he proceed, that although he professed to cut directly into the body of the bladder, without injuring either the urethra or prostate gland ; yet in the dissection of such
bodies

* Vide Morand *Opuscules de Chirurgie*, part. ii. p. 54.

bodies as died of the operation, it was found that on many occasions the prostate gland was divided, together with the *vesiculæ feminales*. In some instances, the bladder was cut in two or three different parts; in others the rectum was divided; and it frequently happened that the bladder was found to be entirely separated from the urethra*. We need not wonder, therefore, that this practitioner, as well as his method of operating, soon fell into discredit. But although this was a consequence which necessarily ensued from the ill success that attended his practice; yet the world, it must be acknowledged, is much indebted to Jacques, for having laid the foundation of the lateral method of cutting for the stone, which, in its present improved state, is practised with so much success over all Europe.

The famous Rau was the first who endeavoured

* For a particular account of Frere Jacque's method of operating, see Dr Lister's journey to Paris; the works of Dionis, Meri, Collet, Saviard, and Morand.

deavoured to improve this operation of Frere Jacques, which he did by using a staff with a deep groove, which enabled him to continue his incision into the bladder with more certainty than it was possible to do without this assistance. But Rau, afraid of wounding the prostate gland, introduced a refinement into his method of cutting, which, in the event, proved extremely prejudicial, and was probably the cause of its being afterwards laid aside. For, instead of dividing the urethra and prostate gland, by which means the extraction of the stone would have been much facilitated, he dissected with much caution by the side of the prostate, till the convex extremity of the staff was discovered in the bladder itself. At this part an incision was made into it, and the stone was afterwards extracted, in the manner then practised for cutting with the great apparatus.

By this method of operating, the rectum and vesiculæ feminales were in great danger of being injured ; the stone was extracted

tracted with difficulty ; and from the depth of the incision the urine did not pass easily off by the wound, so that troublesome sinuses were very frequently forming*.

These inconveniences prevented this operation of Rau's from ever being generally received, and suggested to the celebrated Cheselden the lateral method of cutting, as it is now, with a few alterations, very universally practised.

As this operation of Mr Cheselden's is described by many writers in Surgery, it is not here necessary to enter into a detail of it : We shall, therefore, now proceed to describe the lateral operation in its present improved state.

In order to prevent the patient from being under the necessity of going soon to stool after the operation, the bowels ought to be thoroughly emptied by a laxative
given

* Rau himself kept this method of operating, as much concealed as possible. But an account of it was published after his death by Albinus ; who, by assisting frequently at his operations, became perfectly master of the manner of performing it. *Vide Index suppellestilis anatomicae, &c. Lug. Batavorum.*

given on the preceding day ; and with a view to evacuate the contents of the rectum more entirely, an injection should be given a few hours before the operation is performed.

When the bladder is in a collapsed state, it is liable in this operation to be cut in different parts ; the patient ought therefore to be desired to drink plentifully of some diluent liquor, and to retain his urine for several hours before he is laid upon the table : And when the irritation produced by the disease is found to render a voluntary retention of the urine impracticable, it ought to be effected by a slight compression upon the penis.

These circumstances being attended to, and the perinæum and parts about the anus being shaved, the patient is now to be laid upon a table for the operation. The most convenient height for this table is three feet two inches. It ought to be made perfectly firm : And, in order to afford sufficient space for the patient to lie upon, it ought to be about three feet eight inches

inches long, and two feet and a half wide.

As it is of much importance to have the patient properly secured, it becomes necessary to attend particularly to this circumstance. The most certain method of effecting it is as follows: Let a noose be formed in the double of a piece of broad firm tape about five feet in length; the patient's wrists being introduced at this noose, he ought then to take a firm hold of the outside of the ankle of the same side, when, by different turns of the tape round the hand, ankle, and foot, his hand is to be effectually secured in this position; and this being done on one side, the hand and foot of the opposite side are to be firmly tied together in a similar manner.

The operator ought now to introduce a grooved staff, of a size proportioned to the parts through which it is to pass. These staffs are represented in Plate XII.; the artist who makes them ought to be very attentive in rounding off the edges of the grooves, otherwise they are apt to injure the
the

the urethra; and the further extremity of the groove ought to be perfectly free and open, otherwise it is difficult to disengage the gorget from it after it has been introduced into the bladder. As the groove is only necessary in the convex part of the staff, and from that to its point, the handle of the instrument, down to the commencement of the convexity, ought to be entirely solid, so as to admit of the penis being pressed upon it, without being hurt either by the hand of the assistant, or by a piece of tape, which may be sometimes necessary, as we have already advised, for preserving the urine from being evacuated.

It is necessary to remark, that more attention ought to be paid to the length of the staff than is commonly done. These instruments are generally shorter than they should be; so that when in the course of the operation, the handle of the staff happens to be pressed down upon the groin by the assistant, the point of it is very apt to slip out of the bladder altogether; a circumstance which must always be productive of
much

much hazard and inconvenience. Care therefore, should be taken to have the staff always of a sufficient length.

The stone being again distinctly felt, not only by the surgeon himself, but by his assistants, the patient must now be put into that posture in which he ought to be kept during the remainder of the operation. The table intended to be used ought to be perfectly level; but, that the patient may lie with as much ease as possible during the operation, a pillow may be put under his head, and, in order to raise the pelvis considerably higher than the abdomen, two pillows at least ought to be laid under the buttocks, which should be made to project an inch or two over the end of the table.

The direction we have given for elevating the buttocks, is a matter of much importance, although it is seldom attended to by operators; indeed, the very reverse is commonly practised, the head and upper part of the body being generally kept a good deal higher than the pelvis. This, however, must proceed entirely from inattention

tention on the part of the surgeon : For the least reflection may convince us, that the more erect the body is kept, the greater pressure must be produced by the intestines upon the bladder ; and if by such pressure the fundus of the bladder is pressed down upon its neck, the risk of its being wounded must be very great.

Of such patients as have died of this operation, I have, in two different instances, found on dissection, that the bladder was wounded in three different parts : In its cervix, as is always the case when the gorget is of a proper length ; in its side considerably above the cervix ; and, again, very near to its most superior part. Now this is an accident which can never happen, if the directions we have given are attended to ; for when the bowels are prevented from falling upon the bladder, by keeping the buttocks elevated above the rest of the body, and if at the same time the bladder is properly distended with urine, it must be altogether impossible, in the usual lateral operation, to injure it in an improper part.

part. But if this precaution of having the bladder distended during the operation is neglected, at the same time that the bowels are, by an elevated posture of the upper part of the body, allowed to fall into the pelvis, the bladder must be so completely collapsed, and its fundus pushed so much down upon its neck, as must frequently be the cause of much unnecessary hazard.

Besides these two cases I have mentioned, in which the bladder was after death found to be wounded in different parts, we find a very candid acknowledgment made by a celebrated lithotomist, of his being once so unfortunate in the lateral operation, as to have an immediate protrusion of a considerable portion of the small guts at the wound *.

Such an occurrence would have disconcerted many operators: But, fortunately for the patient, the operation was in this case completely finished; the bowels were reduced and a perfect cure was obtained.

VOL. II.

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Mr

* Vid. Mr Bromfield's *Chirurgical Observations and Cases*, vol. II. p. 264.

Mr Bromfield attempts to account for this protrusion of the bowels in a different manner : But we are much inclined to think, that it must have been owing to the pelvis not having been sufficiently raised above the rest of the body, and to the bladder having been in a collapsed state at the time the incision was made into it. For this author, it must be remarked, instead of ordering the bladder to be distended at the time of operating, desires expressly that it may be emptied immediately before the operation*.

Matters being adjusted in the manner we have directed with respect to the patient, an assistant on each side is to secure his legs and arms : One must prevent him from moving the upper part of his body ; another must lay hold of the staff ; and a fifth will be required to hand the necessary instruments to the operator.

The surgeon, after having again felt the stone with the staff, is now to make the hand of it pass over the right groin of the patient,

* Page 228. Vol. II.

patient, so as that the convex part of the instrument may be distinguished on the left side of the perinæum: In this position it ought to be preserved by the assistant, who with his right hand should lay hold of the handle of the staff, while with his left he elevates and supports the scrotum.

The thighs of the patient being sufficiently separated by the assistants, and the surgeon being seated between the patient and the window, in such a manner as to make the light fall directly upon the parts to be cut, an incision is now to be made through the skin and cellular substance, at least four inches in length in a full-grown person, and so in proportion in smaller-sized people; beginning a little to the left-side of the rapha, about an inch from the termination of the scrotum, and proceeding in an oblique direction along the perinæum, till it is made to run at an equal distance between the tuberosity of the ischium and the anus, which last it ought to pass at least an inch.

As the success of the operation depends in a great measure on this part of it being properly performed, the attention of beginners ought to be particularly fixed upon it. From timidity or inattention, which always proves prejudicial to the patient, this external incision is frequently made much shorter than it ought to be: In many instances, instead of four inches, I have seen it, even in the largest adult, scarcely two. The consequence of this is, that the muscles, and other parts below, cannot be properly divided; the operator has no freedom in prosecuting the other steps of the operation; and if the stone is large, the parts through which it has to pass must be much more bruised and lacerated than if they had been freely divided by the knife; and as there is no risk whatever in making the external incision free and ample, it ought, in every instance, to be done. Much hazard may occur from a small incision of the teguments and muscles; but no detriment can ensue from their being largely laid open.

By

By this first stroke of the scalpel, the skin and cellular substance should be freely divided, so as to bring the subjacent muscles completely into view; when, by a continuation of the incision, the erector penis, accelerator urinæ and transversalis perinæi are also to be divided; and as some part of the levator ani is intermixed with these muscles, it will likewise be cut.

As there is no danger found to occur from a free division of these parts, and as a large opening not only facilitates the extraction of the stone, but admits of any blood-vessel that happens to be cut being easily secured with a ligature, which can never be done when the incision is small, every operator, as we have said, ought to be particularly attentive to this circumstance. In general, the arteries with which these muscles are supplied are not so large as to render this precaution necessary; but whenever it is found to be otherwise, and that a considerable vessel has been cut, and especially if the patient is weak and emaciated, a ligature ought to be immediately applied

before the surgeon proceeds to the other steps of the operation.

In the ordinary method of performing this operation, the surgeon now proceeds to lay open the urethra, and enters the point of the knife into the substance of the bulb itself. But this adds greatly to the hazard of the operation: For, independently of the blood-vessels of the bulb being frequently pretty large, but which indeed may, when the external incision is extensive, be secured, sinuses are much more apt to form; and the cure of the wound is therefore much more tedious when this part is divided, than when no injury is done to it; and as a division of the bulb is not by any means necessary, it ought always to be avoided. When, therefore, the incision of the muscles is completed, the operator ought to search for the staff with the index of his left-hand; and having found it, he is now to push the point of his finger along the course of it till he passes the bulb, when, with the edge of his knife turned towards the groove of the staff, he is to divide the
membranous

membranous part of the urethra in its whole course, from the prostate gland to the bulb; and as the finger is made use of as a director, and as by means of it the rectum is effectually preserved from being injured, this incision of the urethra may be made with perfect safety. Indeed, there is in general such a quantity of cellular substance between the urethra and rectum, as renders it impossible, in this part of the operation, to cut into the gut, if the surgeon is not either very unsteady or inattentive: And by means of the precaution we have recommended, of keeping the fore-finger of the left-hand always between the knife and the intestine, it may in this manner be on every occasion very certainly avoided.

The incision of the urethra being now completed, the prostate gland, which may be evidently discovered by the finger, is next to be divided. In the hands of an expert surgeon, a patient would be equally safe by having the operation finished with the scalpel as with any other instrument:

For, by continuing the incision of the urethra, and carrying on the scalpel so as to divide the prostate gland laterally, if the finger is still continued between the knife and the rectum, no risk whatever could occur from it: But as this part of the operation is performed entirely by feeling, without the assistance of the eye-sight; and as many operators are not so much accustomed to this kind of business, as, in such circumstances, to have a sufficient degree of steadiness, it is probable the rectum would be frequently wounded if the scalpel was usually employed for finishing the operation.

This inconvenience, however, of wounding the rectum, may be effectually avoided by using a cutting director, or Gorget, as it is termed, instead of a scalpel: This instrument was originally the invention of Mr Hawkins of London. It is represented in Plate XIV.; and in Plate XIII. different views of an instrument are delineated, which I consider as a very material improvement of Mr Hawkins' gorget,

get. The gorget of Mr Hawkins is contracted too much at the cutting part of it, which prevents it from dividing the prostate gland sufficiently. If we were to use a gorget much wider in the cutting part of it than is usually done, the opening through the prostate gland might indeed be made extensive enough: But the gorget in common use will by no means effect this; the division of this gland being in general quite too small, either for the extraction of a stone, or even for the introduction of the forceps, without much laceration; a circumstance which we ought to guard against as much as possible.

The gorget in ordinary use is made to expand greatly behind; the diameter of the blunt part of it being at least twice the extent of that of the cutting point. This will appear to be very unnecessary, when we consider, that the only use of the gorget, after it has cut through the prostate gland, is to serve as a conductor to the forceps; and as this purpose may be answered equally well by a director that does
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not expand to near the extent that the gorget does, it is obviously improper to have this instrument so wide as it is commonly made. But farther, the impropriety of this construction is still more evident, when we compare the size of the common gorget with the parts through which it has to pass: For it is perfectly evident, that the latter, and particularly the urethra, must be greatly injured by the forcible introduction of the former; the back-part of the gorget being so wide and deep, as to render its passage through the urethra quite impracticable, without much laceration.

The cutting director we have mentioned above, will be found to possess all the advantages of the gorget, without any of its inconveniences: The cutting part of it expands more than that of the gorget, it therefore divides the prostate gland more freely; and as the blunt part of it is much contracted, no injury is done to the urethra on its being pushed into it. To those who have never used this instrument, and who thereby may have a partiality for the gorget,

Plate XIII.

Fig. 1.



Fig. 2.



Fig. 3.

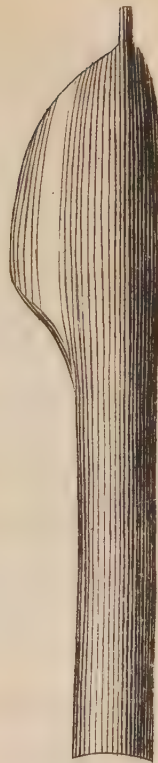


Fig. 4.



gorget, it may perhaps appear that it is not sufficiently wide for serving as a director to the forceps : This, however, is not the case ; and it will soon be found, that it is not only more easily introduced than the gorget, but that it answers equally well for conducting either the finger or the forceps.

It has been objected to this instrument, that it will not probably make such a free division of the muscles as is obtained by the gorget. This observation, however, proceeds solely from prejudice in favour of an instrument with which practitioners are as yet better acquainted, and which has indeed been deservedly much employed ; but it is thrown out without due reflection on its import. We have already endeavoured to inculcate the necessity of a free division of the teguments and muscles in this operation ; but whoever considers this point with attention will see, that this ought to be effected with the scalpel alone, and that it should not depend in any degree upon the gorget : All that should be left for the gorget or cutting-director to do, is to divide the prostate gland with a small portion of
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the neck of the bladder. Some practitioners have indeed recommended instruments for carrying the incision into the body of the bladder ; but this is a very hazardous attempt, and it is not in any respect necessary : For as soon as the prostate and neck of the bladder are divided, the forceps are admitted with much ease ; and the bladder itself is so easily dilated, that it very readily yields to the passage of the stone, however large it may be. We would wish to have it understood, that it is not the size of the wound in the bladder which renders the extraction of stones easy or difficult ; and that it is the previous free incision of the muscles and prostate gland upon which this almost entirely depends.

The membranous part of the urethra being divided by the scalpel in the manner we have directed, the nail of the index of the left hand ought to be introduced into the groove of the staff, in order to serve as a conductor to the point or beak of the cutting-director. And the surgeon having no further occasion for the scalpel, must now lay it aside ; and having introduced

ced the point of the director into the groove of the staff, he is now to take the handle of that instrument from the assistant, and having raised it considerably from the groin of the patient in which it lay, he must with his left hand preserve it firm in this situation, while with his right he pushes on the director till it has passed freely into the bladder; a circumstance which is rendered evident at once by the urine rushing plentifully out at the wound. In executing the first part of the operation, the surgeon ought by all means to be seated; but in passing the gorget or director into the bladder, as likewise in the extraction of the stone, he ought to stand immediately before the patient, as in this posture these steps of it are more easily performed.

Much attention is necessary, in this part of the operation, in raising the staff to a proper height before pushing on the gorget. The staff ought to form nearly a right angle with the body of the patient; and if kept sufficiently firm in this position, the gorget or director may be pushed

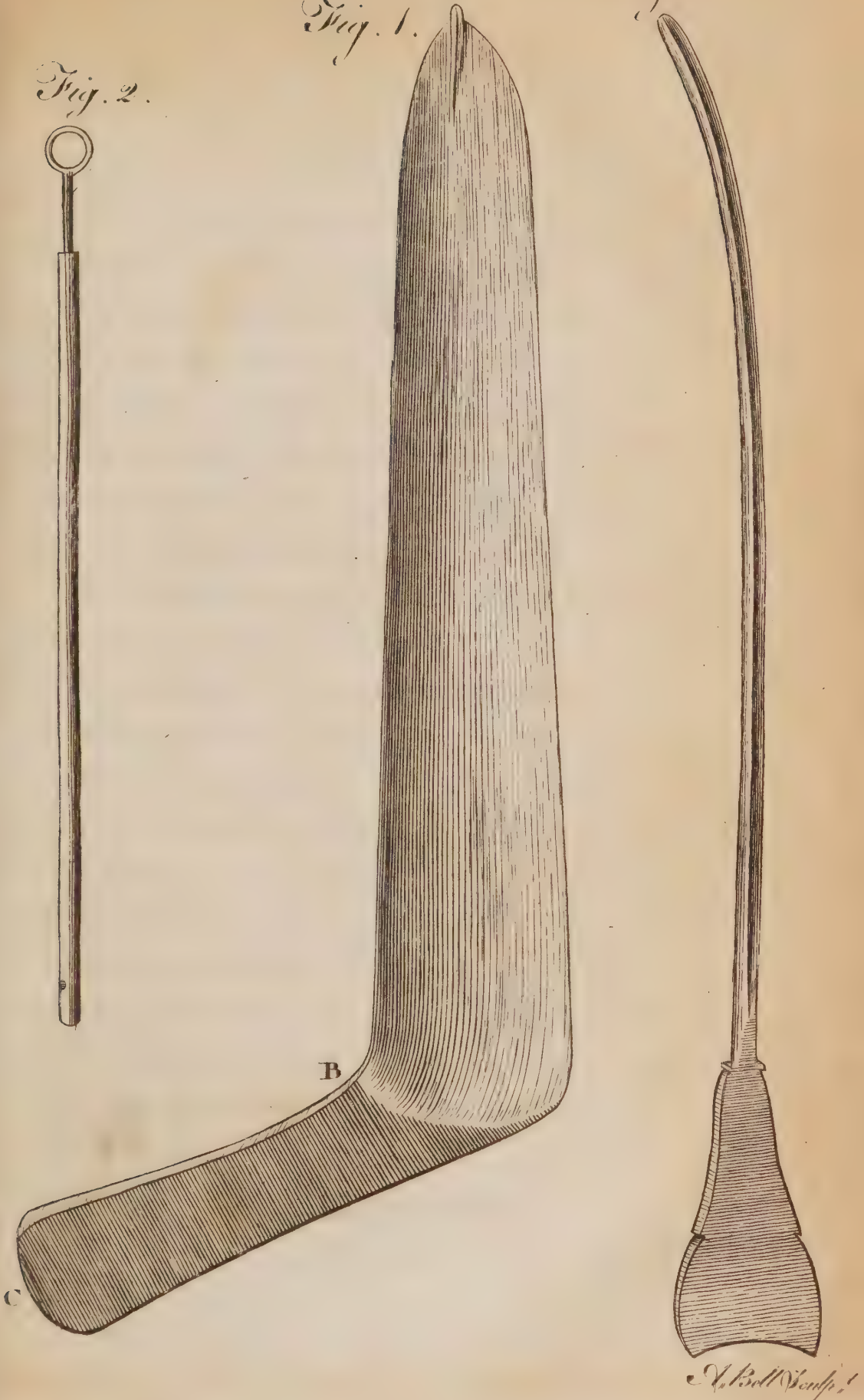
ed on with great safety, as the beak of the instrument, if this direction is attended to, can scarcely escape from the groove of the staff. But if the elevation of the staff is either much greater or much less than this when the gorget is pushed forward, its point, instead of getting into the bladder, must be forced out of the groove, and passing between the rectum and bladder, or between the bladder and pubes, it must here run the risk of doing much mischief. I have known even expert surgeons, from an unpardonable degree of inattention, fall into this error with regard to the height of the staff. Younger practitioners, therefore, cannot be too much on their guard against it.

While attention is thus given to the elevation of the staff, care ought also to be had that the beak of the director or gorget be exactly fitted to the groove intended to receive it; for if these are not properly adapted to one another, the gorget cannot run so easily as it ought to do. Besides, if the beak of the instrument is turned a little inwards, as is represented in Plates XIII. and XIV. it is pushed forward

Fig. 1.

Fig. 3.

Fig. 2.



ward with more safety than when the point of it is either in a direct line with the instrument, or, perhaps, somewhat turned back, as is too frequently the case.

In order to render this part of the operation perfectly safe, different inventions have been proposed for fixing the beak of the cutting gorget so effectually in the groove of the staff, as to prevent it from getting out of it till it has passed into the bladder: But every contrivance of this kind produces some difficulty in passing the instrument; and besides, there is not the least necessity for it, as no operator can possibly go wrong if he attends sufficiently to what he is doing.

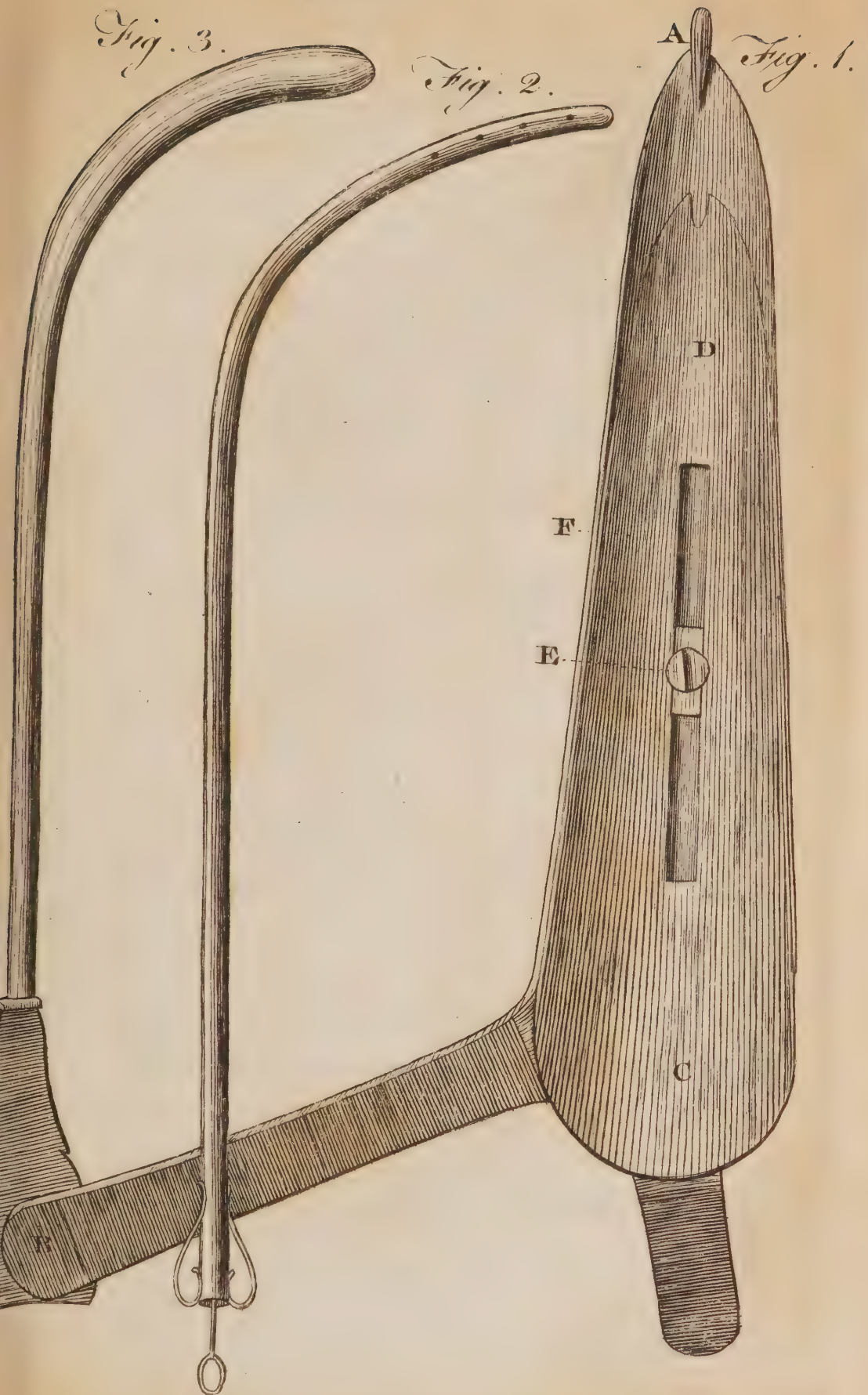
As soon as the gorget has freely entered the bladder, the staff ought to be withdrawn; and this being done, the next step in ordinary practice is, to introduce the forceps immediately; but as the stone may be frequently felt by the finger, and as no other method serves so effectually to discover its real situation, this precaution of introducing the finger into the bladder
ought

ought never to be omitted. If the stone cannot be felt by the finger, the pain of the patient is not increased by its introduction; and if the operator is lucky enough to discover it, he is thereby instructed with some certainty of the best direction for the forceps.

The situation of the stone being in this manner discovered, or if, upon trial, it is found that the finger cannot reach it, forceps, proportioned to the size of the patient, are to be introduced along the course of the director or gorget, while the latter is to be immediately withdrawn.

In an operation of such importance as this, the most trifling circumstance is worthy of attention; for the more obvious and leading parts of it may be performed in the most masterly manner, and the whole be rendered unsuccessful by the operator not attending so accurately as he ought to do to the more minute steps of it. Even the method of withdrawing the cutting-director or gorget, is a matter which requires attention, much more, indeed, than is commonly

Plate XV.



monly given to it. After the forceps are introduced, the gorget ought to be slowly withdrawn in the exact direction by which it is entered ; for if it be turned in any degree either to one side or other, it must of necessity make another incision, not only in the prostate gland, but in all the other parts through which it is made to pass ; the impropriety of which is too obvious to require any further animadversion.

If the stone has been previously discovered by the finger, it is commonly easily laid hold of with the forceps ; but when the finger has not been able to reach it, it is on some occasions with much difficulty met with. The forceps must necessarily be introduced shut, that is, with their blades as near to one another as their form admits of ; for, with a view to prevent them from laying hold of the bladder, they should be so constructed as not to meet at any part except at their axis, by at least the tenth part of an inch. But as soon as they have entered the bladder, they should be gradually

VOL. II. H opened ;

opened ; and in this expanded state ought to be easily moved about, with their handles sometimes depressed and sometimes elevated, till the stone is discovered, when it is to be immediately laid hold of. It frequently happens, however, even with very expert surgeons, especially when the stone is small, that it is not readily discovered by the forceps. In such instances it is sometimes met with near to the fundus of the bladder ; but it is most frequently found concealed in the under and back part of it, near to its neck, in that bag which we have mentioned as being formed by the natural pressure of the urine. When it is found to be in this situation, nothing will bring it so readily into contact with the forceps, as elevating this part of the bladder by introducing the finger into the rectum.

In general, straight forceps, such as are represented in Plate XVI. fig. 1. and 2. are preferable to those that are much crooked, delineated in fig. 3. For they not only prove more effectual for extracting the stone, but serve equally well with the others for discovering

Plate XVI.

Fig. 2.

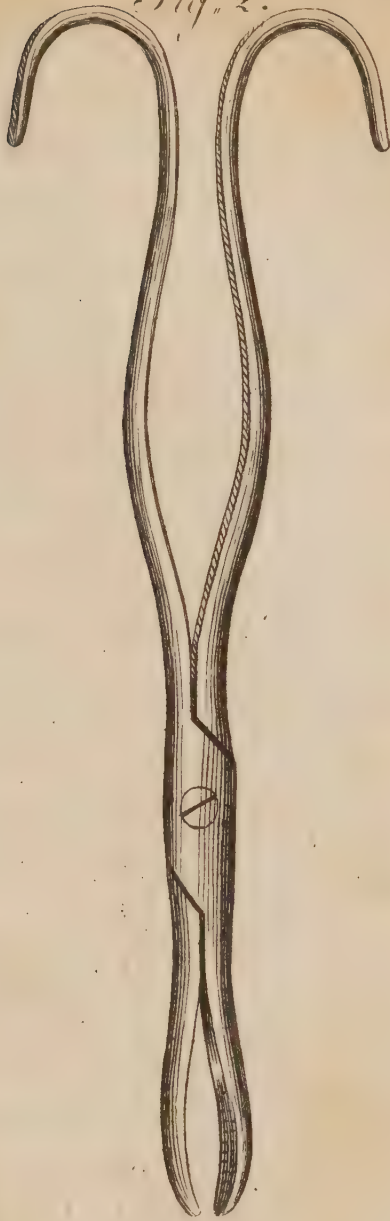


Fig. 1.

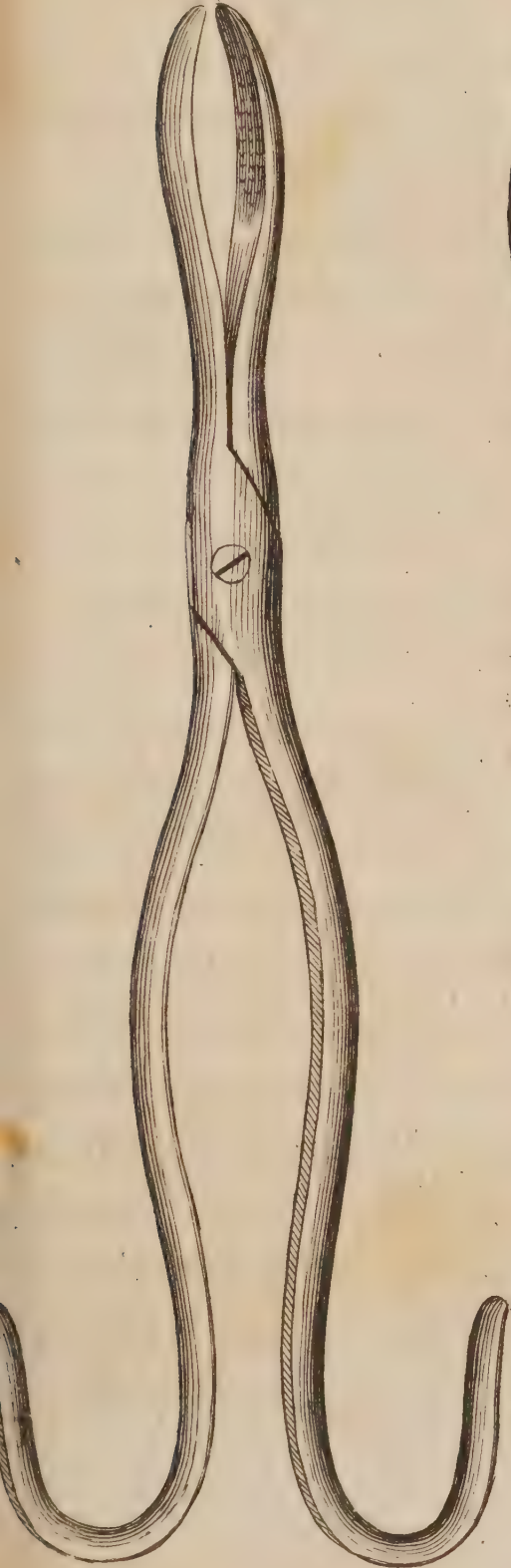


Fig. 3.



J. Bell Sculp.

covering it. Every operator, however, ought to be provided with all the varieties of forceps that are now in ordinary use.

When much difficulty occurs in discovering the stone, it is frequently alleged by operators, that this proceeds from its being contained in some preternatural bag or cyst; and when it is laid hold of by the forceps, and requires an unusual degree of strength to extract it, this is commonly said to arise from the stone adhering to the coats of the bladder. That the weight of a stone will sometimes form a partial cavity for itself, by pressing that part of the bladder on which it lies into the neighbouring soft parts, there is no reason to doubt; and in some instances the bladder is found to have been so much contracted round a stone, as to form almost two distinct bags. Such occurrences, however, are exceedingly rare: And the adhesion of stones to the bladder, we believe to be still more so, if it ever takes place. Stones have indeed been frequently found covered with the coagulable part of the blood, which on some occasions

becomes so firm and tough, as to have the appearance of an organised membrane; but we are perfectly unacquainted with any process of nature by which an adhesion can be produced between the bladder and a stone contained in it.

It is very improbable that it can take place in consequence of a communication of blood-vessels betwixt the bladder and stone: And it is equally improbable that it can be produced merely by agglutination; for, by the intervention of the urine, with which the bladder is constantly moistened, such an effect must be very certainly prevented.

But it is not reasoning alone that militates against this opinion. For although such an occurrence has been frequently mentioned by authors, yet we do not meet with one authenticated instance of any firm adhesions betwixt the bladder and stones contained in it being discovered after death: We are therefore led to conclude, that this idea is entirely void of foundation; and that it has probably originated from the misconduct of operators, who;

who, by making the external incision too small, or by not dividing the muscles and prostate gland sufficiently, have experienced much difficulty in extracting a stone of even a moderate size, and who, to escape censure, have suggested the possibility of stones adhering to the internal coat of the bladder.

When the stone is laid hold of by the forceps, the operator, before he proceeds to extract it, ought to introduce his finger into the bladder, in order to discover whether it is properly fixed in the forceps or not. In many instances, this is of much advantage; for when it is discovered that a stone of any considerable length is laid hold of in such a manner as to have its longest diameter made to press in a transverse direction with respect to the opening in the bladder, much pain and laceration, which would undoubtedly occur from extracting it in this direction, may be easily prevented, either by turning the stone with the point of the finger, when this is found to be practicable, or by

letting it slip altogether out of the forceps, and again endeavouring to lay hold of it in a more favourable position. When the operator is certain that this is properly accomplished, he is then to proceed to the extraction of the stone, which ought to be done in a very slow and gradual manner: He ought to hold the forceps firmly in both hands, his right being applied towards the extremity of the handles, and his left near to the common axis.

In ordinary practice, if the stone does not come readily away, the force made use of is commonly applied so as to dilate the parts equally in every direction. The stone is made to move not only upwards and downwards, but laterally; and, on some occasions, even a rotatory motion is given to it. Nothing, however, can be more destructive to the parts through which the stone must pass than such a practice, while at the same time it is evidently ill calculated for facilitating the extraction of it.

Instead of moving the stone in this manner, the pressure ought to be made almost entirely

entirely downwards; not directly from the symphysis of the pubes towards the anus, but in the course of the external wound, which ought, as we have already said, to run between the anus and the tuberosity of the ischium. As it will be readily admitted, that the force employed in extracting a stone will prove more useful when exerted upon soft yielding parts, than when applied immediately upon a bone; so, whoever attentively considers the anatomy of the parts concerned in this operation, will see the propriety of the advice we have now given. The opening into the pelvis is at this place so extremely narrow, that a very slight examination must convince any one, that in the extraction of a stone no advantage can be derived from lateral pressure. If again the stone is pressed upwards, it must press against the bones of the pubes; for in this direction nothing intervenes between these bones and it, except the urethra, and a small quantity of cellular substance: And if it be directed towards the anus, it must press the rectum

against the point of the coccyx; a circumstance which must not only produce much immediate distress to the patient, but which must even add to the hazard of the operation.

The rotatory motion which in this operation is sometimes given to a stone unites all these disadvantages; but by carrying the pressure downwards in the course of the wound, so as to fall between the anus and ischium, every inconvenience of this kind is avoided, and a more extensive dilatation is obtained than can possibly be procured in any other direction.

By a proper and gradual application of pressure in this direction, the stone, if it is not very large, will be at last extracted: In the course of the extraction, however, if the operator finds considerable resistance to the passage of the stone, he ought to examine the state of the divided parts, and if any part of the muscles which ought to have been cut are still found to be entire, they should be immediately laid fully open; and the easiest method of doing this, is, to
secure

secure the stone in the forceps with the left hand, while a scalpel is employed in the other for effecting what is necessary.

In order to prevent the forceps from pressing so much upon the stone as to be in danger of breaking it, some inventions have been proposed for rendering the degree of pressure employed by them steady and certain. Of these the best seems to be what is represented in Plate XVIII. fig. 3. in which, as soon as the stone is laid hold of, it is preserved in the same position by means of a screw which passes from one of the handles into the other. During an operation, however, every incumbrance of this kind proves troublesome, and there is not in fact the least occasion for such an improvement: For, when a stone is small, no surgeon of experience will apply great force in the extraction of it; and when it is very large, it will be more for the patient's advantage that it should break than be extracted entire.

We have already had occasion to speak of the great risk which occurs from the
extraction

extraction of stones of a large size ; indeed, this, as we have said, is so considerable, as to warrant this conclusion, that, *cæteris paribus*, the hazard attending the operation of lithotomy may be considered as corresponding to the size of the stone to be extracted. In healthy subjects, when the stone is small, and when the operation is properly performed, there does not die above one in twenty : But, altho' a few instances have occurred of patient's recovering, from whom stones have been extracted of a large size, yet whenever the stone exceeds seven or eight ounces in weight, so far as I am able to judge, not above one in ten recovers.

This, therefore, is a most material circumstance, and worthy of our most serious attention ; and although the breaking of a stone in the course of extraction, is in other respects disagreeable, yet, with a view to obviate the dreadful consequences which commonly ensue from tearing out a very large stone, when in the course of an operation it is found that the stone is of an
uncommon

Plate XVII.

Fig. 1.

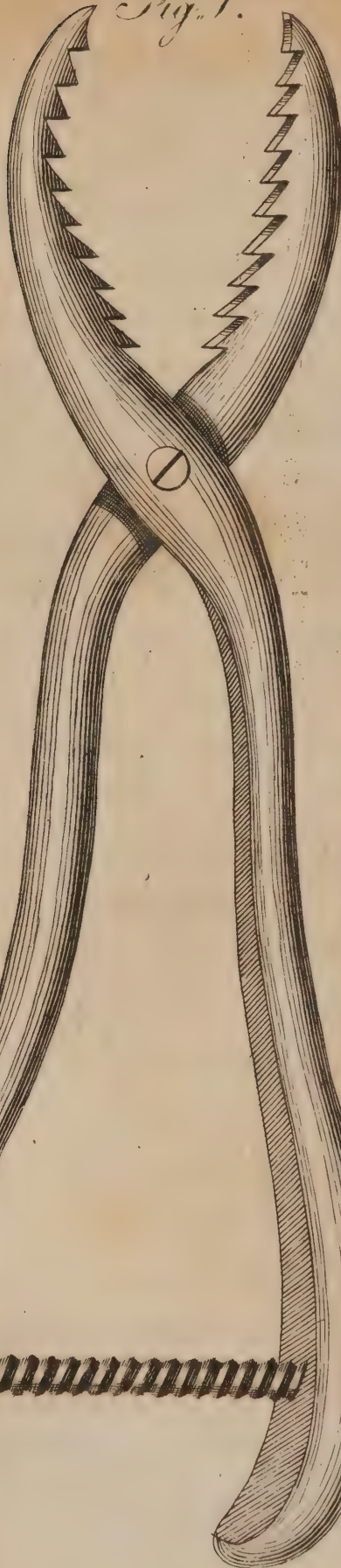
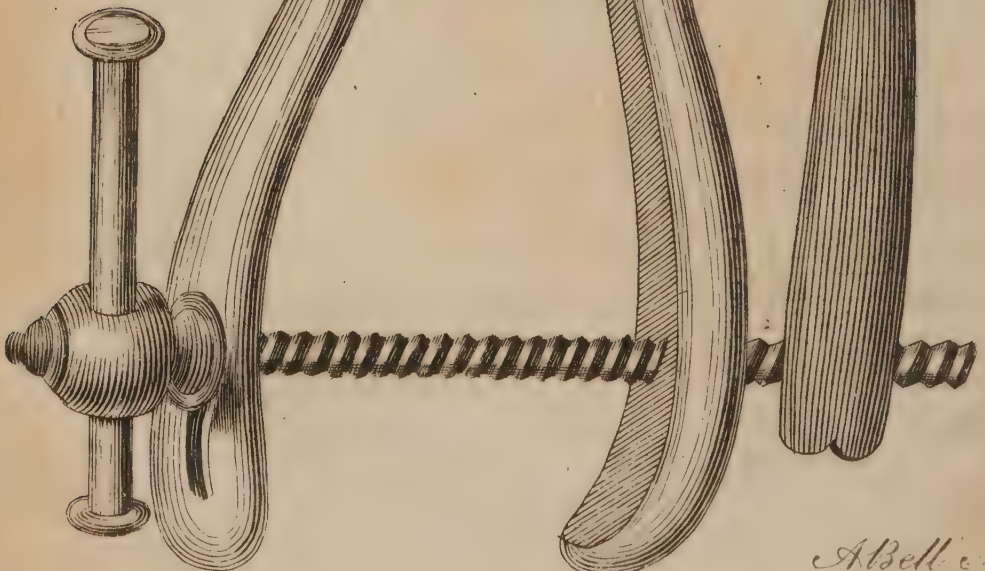
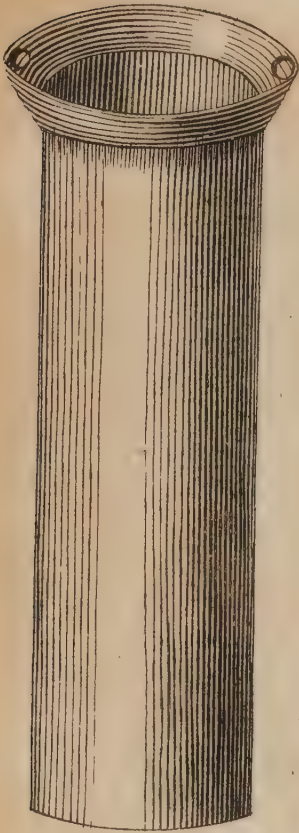


Fig. 2.



Fig. 3.



uncommon magnitude, and that it cannot be extracted but with great hazard to the patient, might it not be more eligible, either to endeavour to break the stone with the forceps already introduced, or to withdraw these, and to introduce an instrument represented in Plate XVII. fig. 1. originally invented for this purpose by Andreas à Cruce, and since improved by Le Cat and others? By means of the long and strong teeth with which these forceps are furnished, and especially by the intervention of the screw for compressing their handles, almost any stone may be broken into very small pieces; and as soon as this is effected, the different pieces may be extracted with the common forceps.

In such circumstances, however, or when a stone has broke by accident in the course of any operation, the utmost care is necessary in order to extract every fragment of it; for, if the smallest particle be left, if it be not afterwards washed off with the urine, it may prove very prejudicial, by serving as a nucleus for the formation of another stone.

stone. After all the larger pieces have been extracted by the forceps, a scoop, such as is represented in Plate XVII. fig. 2. is sometimes found serviceable for taking out the smaller particles ; but for this last purpose nothing ever proves so effectual as injecting, either with a syringe or a bag and pipe, large quantities of warm water, which, when a proper heat and a due degree of force are attended to, may be thrown in without injury ; and it commonly proves very effectual for the purpose for which it is employed.

When a stone is extracted with a smooth polished surface, it is commonly supposed that there will be others remaining in the bladder, as this smoothness is imagined to be owing to the friction produced by other stones ; and, on the contrary, a rough unequal surface is supposed to denote the existence of one stone only. No dependence, however, ought to be placed upon these circumstances : For every practitioner must have met with instances of a single stone with a smooth surface ; and,
on

on the contrary, a stone of a rough unequal surface has been found where there have been more than one in the bladder. As soon, therefore, as one stone is extracted, the operator, instead of trusting to any appearances of the stone, ought first to search with his finger, and then, either with the forceps, or with the thick curved instrument represented in Plate XV. fig. 3. which may be termed a Searcher, and which answers the purpose better; and as long as any stones are discovered, the forceps are to be repeatedly introduced till the whole are entirely extracted.

In the course of this operation, some blood-vessels are unavoidably divided; but when the incision is kept as low down in the perinæum as we have directed, and when therefore the bulb of the urethra is avoided, there is seldom much risk to be apprehended from any hemorrhagy that ensues. It now and then happens, however, that those branches of the internal iliac artery which supply the parts lying anterior to the prostate gland, are so considerable

able as, when divided, to pour out a good deal of blood: But as a free discharge during the operation has a considerable influence in preventing inflammation, a symptom which is more to be dreaded than any other occurrence subsequent to lithotomy, nothing in general should be done to put a stop to the hemorrhagy till the stones are all extracted; when, if the discharge still continues, any divided artery that appears ought to be secured with a ligature; and if the external incision has been made large and free in the manner we have directed, this is a part of the operation by no means so difficult as is commonly imagined. On different occasions, I have passed a ligature upon an artery almost as deep as the prostate gland; and when a large vessel has been cut, the advantage derived from this effectual method of securing it, is of itself a very important argument for making the external incision in every instance very free and extensive.

When, however, the divided vessel cannot

not be secured with a ligature, we are then to endeavour to stop the hemorrhagy by pressure ; and for this purpose a firm roller introduced at the wound would answer very effectually : But in order to avoid any stoppage to the flow of urine, instead of a solid roller, a silver canula covered with soft linen may be employed with advantage ; a figure of such an instrument is represented in Plate XVIII. fig. 3. Notwithstanding, however, every precaution, some of the deep-seated arteries, which have been divided by the operation, continue sometimes to pour out a great deal of blood, and which, instead of passing off by the wound, is, in some instances, collected in great quantities in the cavity of the bladder. As soon as this is perceived, some means ought to be attempted for its removal ; and the most effectual of these are, to extract as much of the coagulated blood as possible, by a proper use of the scoop already mentioned, and afterwards by the frequent injecting of warm water by the wound, to wash off the remainder. In this manner

manner very large collections of blood have been evacuated; and when, as has sometimes happened, means of this kind have not been employed, the coagulum in the bladder has at last become so firm, and has filled up the cavity of that viscus so effectually, as to prevent entirely all further deposition of urine. In such instances, the abdomen becomes pained and much tumefied; the fever gradually increases; and death itself very commonly succeeds.

With a view to prevent such an unfortunate occurrence with as much certainty as possible, every patient should, immediately after the operation of lithotomy, be placed in such a posture as most effectually to evacuate any blood that may be discharged: Instead of laying the head low, and the buttocks high, as is commonly done, the pelvis should be considerably lower than the rest of the body; by which means the wound is kept in a depending posture, which serves to assist the evacuation of any blood that the divided arteries may throw out. As soon as any flow of blood that has
occurred

occurred is stopt, the patient should be untied, and a piece of soft lint being inserted between the lips of the wound, the thighs should be laid together, and in this position he should be carried to bed ; and a considerable dose of laudanum being administered, he ought for some time to be left entirely to the charge of the nurse in attendance. No dressing whatever answers so well as a piece of dry soft lint : For as the urine is constantly running off by the wound, and as the parts are thereby kept very wet and are apt to fret, it becomes necessary to renew the dressings frequently ; and nothing is either more easily applied or removed than a piece of dry lint.

When the stone has not been difficult to extract, the patient generally remains easy, and free from much pain ; and he frequently falls into rest, and procures some sleep during the first three or four hours after the operation : But when the stone is large, and when much violence has been done to the parts in extracting it, a severe pain in the under part of the abdomen

often supervenes in the space of an hour or two from the operation; and this, we must observe, when it does not soon yield, is one of the most alarming symptoms which occur. If it is merely of a spasmodic nature, however, which in some instances it appears to be, it is commonly soon removed by the use of warm fomentations to the belly, or by emollient, and especially by anodyne injections thrown up by the rectum.

When by a continuance of these remedies the pain is found to abate, little or no anxiety need be entertained on account of it; but when, instead of becoming less violent, it proceeds to increase, and especially when the abdomen becomes hard and tumefied, and the pulse full and quick, and when these symptoms continue to be aggravated, much danger is to be dreaded. As they almost constantly originate from inflammation, blood ought to be taken in quantities proportioned to the violence of the disorder; emollient injections ought to be continued; and if the local application of heat to the abdomen, either by
warm

warm flannels, or by warm water contained in a bladder, is not found to answer, the patient should be immediately put into the semicupium. Indeed, in such circumstances, I have experienced more advantages from this than from any other remedy; for the heat is not only applied with more effect directly to the parts affected, but a free discharge of urine by the wound is also more commonly procured by this than by any other means, and accordingly much relief is often obtained from it.

A due continuation of these means, with a proper use of opiates, a low diet, and a free use of diluent drinks, will frequently remove very alarming symptoms. But, in some instances, all our efforts prove ineffectual: The pain and tension of the abdomen continue to increase; the wound, instead of putting on a kindly healthy appearance, remains sloughy and ill-conditioned; the quickness of pulse, and other symptoms of fever, increase; and death closes the scene. But, when matters ter-

minate happily, the wound by degrees acquires a healthy aspect: The urine, in some instances, passes by the urethra from the beginning; but in most cases it comes away by the wound for the first two or three weeks: The pain in the abdomen gradually abates; and any symptoms of fever which at first prevailed, are in a short time entirely removed.

The period at which a complete cure of the wound is effected, is exceedingly various, and depends much on the state of health the patient is in: In some few cases of young healthy boys, I have known the wound completely cicatrised in less than three weeks; but in others, this is not accomplished till the sixth, seventh, or eighth week. Unfortunately, in some instances, again, although a great part of the sore heals perhaps quickly enough, yet a small opening is left, at which the urine continues to be discharged, and, the edges of the passage becoming callous, a real fistulous opening is produced, which cannot be cured but by another operation; the
manner

manner of performing which we shall presently have occasion to mention. Indeed the prevention of fistulous openings depends much on proper attention in dressing the wound. If care be taken to introduce the lint sufficiently within the lips of the wound, till granulations fill up the bottom of the fore, there will seldom be any risk of fistulous sores: At the same time, however, the wound ought not to be much crammed, either with lint or with any other dressing: For in this case the edges must either inflame, or acquire a morbid degree of hardness. In other respects the treatment here ought to be nearly such as is known to answer in similar wounds in other parts. It is proper, however, to observe, that nothing removes so effectually that excoriation of the buttocks, which sometimes proves very troublesome after the operation, from their being kept constantly wet with the urine, as their being frequently washed either with brandy or any other ardent spirit, or with lime-water.

In patients of a weak, feeble constitution, an incontinence of urine frequently occurs after the operation of lithotomy. In general, however, this is removed upon the patient recovering his former degree of strength; and the use of the cold bath, Peruvian bark, and a nourishing diet, contribute much to this effect. But, in order to obviate the immediate disagreeable effects of a constant discharge of urine, different instruments have been contrived: Some of these have in view the compression of the penis, in order to prevent the urine from being discharged; and others are intended to be concealed within the patient's breeches, and to serve as receptacles for the urine on its passing from the urethra.

In Plate XIX. fig. 1. is represented the most convenient form of the former of these; and in fig. 2. is delineated a receiver, which by experience has been found to answer the purpose of the latter both easily and effectually. And these instruments, it is obvious, may be used in all cases

cases of incontinence of urine, whether originating from this operation or from any other cause.

Hitherto we have been supposing the operation to take place in a male subject only; but although the shortness and width of the urethra in women renders them much less liable to stone in the bladder than men, yet instances frequently occur of this disorder in females; and whenever it does so, and when the symptoms produced by it are violent, some means must be employed for relief.

While from the shortness of the urethra women are less liable to the stone than men, the operation of lithotomy with respect to them, is, on the same account, much more simple, and of course more easily performed. It cannot be done by cutting from the perinæum, in the same manner as in male subjects; for, as the urethra and bladder lie immediately above the vagina, any opening made into them from the perinæum, must of necessity pass through the vagina, so as to wound it both

above and below: And this was considered as a very material objection to the lateral method of cutting, upon its first introduction. There is not here, however, the least necessity for doing any injury to the vagina, as the urethra may be divided from one extremity to the other, without any risk of touching it.

The patient being placed upon a table, and secured in the manner we have already directed, a grooved staff, such as is represented in Plate XIV. fig. 3. is to be introduced into the bladder, by passing it through the urethra, which lies between the nymphæ, immediately below the clitoris; and the operator, keeping it firm with his left-hand, is with his right to introduce the beak of the cutting director into the groove, and to run it easily along till it has fairly entered the bladder. He ought now, as in male subjects, to introduce his finger along the director; and having discovered a stone, should proceed to extract it in the manner we have already recommended.

By

By the old method of cutting in females with the greater apparatus, no incision was made into the urethra, but different instruments were used for the purpose of dilating it; and when this was supposed to be sufficiently effected, the forceps were employed for extracting the stone. In this manner, however, much laceration was produced; the patient suffered a great deal of unnecessary pain, and the bladder was commonly deprived of all power of retention. We have no difficulty, therefore, when operating on female subjects, in preferring the method we have recommended, of laying the urethra open through its whole length.

As the bladder in females lies immediately above, and quite contiguous to, the vagina, it has been proposed, that instead of laying open the urethra, as we have directed, an opening should be made directly into the bladder from the vagina, at which the forceps are to be introduced for extracting the stone. One case of this kind we find recorded by Bussiere*; and, more lately,

* Philosophical Transactions for the year 1669, p. 106.

lately, other three are related by the ingenious Mr Gooch, in which this method of extraction was successfully employed*. It has never, however, been generally adopted; and as various objections occur to it, we do not think it will ever be frequently put in practice.

By cutting into the bladder through the vagina, parts are injured, which by the other method may be avoided: The stone, when it does not lie directly upon the vagina, is with difficulty laid hold of; it cannot be so easily extracted as when drawn along in the course of the urethra; fistulous openings must in all probability occur more frequently after this than after the other method of operating; and if the woman should afterwards become pregnant, the cicatrix formed in the vagina would produce pain, obstruction, and perhaps laceration in the time of delivery.

One great advantage which the lateral operation, in its present improved state, possesses

* *Vide Cases and Remarks in Surgery*, vol. ii. p. 182. by Benjamin Gooch.

possesses over the others, both in males and females, is, that no laceration whatever is produced by it unless the stone is remarkably large; in which case, no precaution with which we are acquainted has any influence in preventing it: But, in ordinary cases, where the stone is not large, if the parts are divided in the free manner we have recommended, all the risk attending laceration, and which we have endeavoured to point out as the most hazardous part of this operation, is very effectually avoided.

We have thus described the various means hitherto employed by practitioners, for extracting stones from the bladder; and from what has been said, it must readily appear, that the lateral operation is, in ordinary cases, greatly preferable to every other. Indeed it stands so eminently superior to the others for general use, that we do not consider it as necessary to draw any farther comparison between them; but, as we have already observed, particular cases do sometimes occur in which the
high

high operation may with great propriety be employed instead of it, we have already in strong terms pointed out the risk which occurs from extracting a large stone by the lateral method of cutting; and we have shown, that stones of any magnitude which the bladder can contain, may be extracted by the high operation. Whenever, therefore, it is known with any tolerable certainty, that a stone is of an uncommon size, and when the high operation is in other respects admissible, it ought certainly in every such instance to be preferred: For although in cases of large stones it may be better to break them into small pieces in the manner we have directed, than to lacerate the parts by extracting them entire; yet this practice is only advisable when the operator unexpectedly meets with a large stone after the bladder has been cut into: And whenever it happens otherwise, and the stone is previously known to be very large, much advantage may accrue to the patient from a judicious choice,

choice, on the part of the operator, of his method of operating.

In the directions here laid down for performing the lateral operation, the dictates of experience are strictly adhered to, and nothing is recommended that is not either at present very generally adopted, or that I have not myself put in practice.

Many ingenious proposals have been made by individuals for the improvement of the operation of lithotomy, particularly of the lateral method of cutting: But a minute detail of all that has been suggested upon this subject, is incompatible with the nature of this work; nor could it serve any purpose, but to bring into view some particular modes of practice, which were either never generally followed, or which, if adopted, have fallen again into disuse.

The most remarkable of these proposed improvements of the lateral operation, are those of three French Surgeons, Monsieur Foubert, Monsieur Thomas, and Frere Cosme. The two first of these gentlemen invented

vented instruments for penetrating the body of the bladder without interfering with the urethra. The bladder being distended with urine, and an incision made through the skin and cellular substance, a cutting instrument of a particular construction is then directed to be pushed past the urethra into the side of the bladder; and an opening being made of a sufficient size, the stone is to be extracted in the usual manner. One material advantage proposed from this improvement is, that by the urethra and prostate gland being avoided, that inability to retain the urine, and other troublesome consequences, which sometimes ensue from injuries done to these parts, are not so apt to occur when the body of the bladder alone is wounded. But, independent of any other objection to which this method of operating is liable, this of itself must serve effectually to prevent it from being ever very generally received, namely, the wound in the bladder being sure to recede from the wound in the teguments as soon as all the water contained
in

Fig. 1.



Fig. 3.

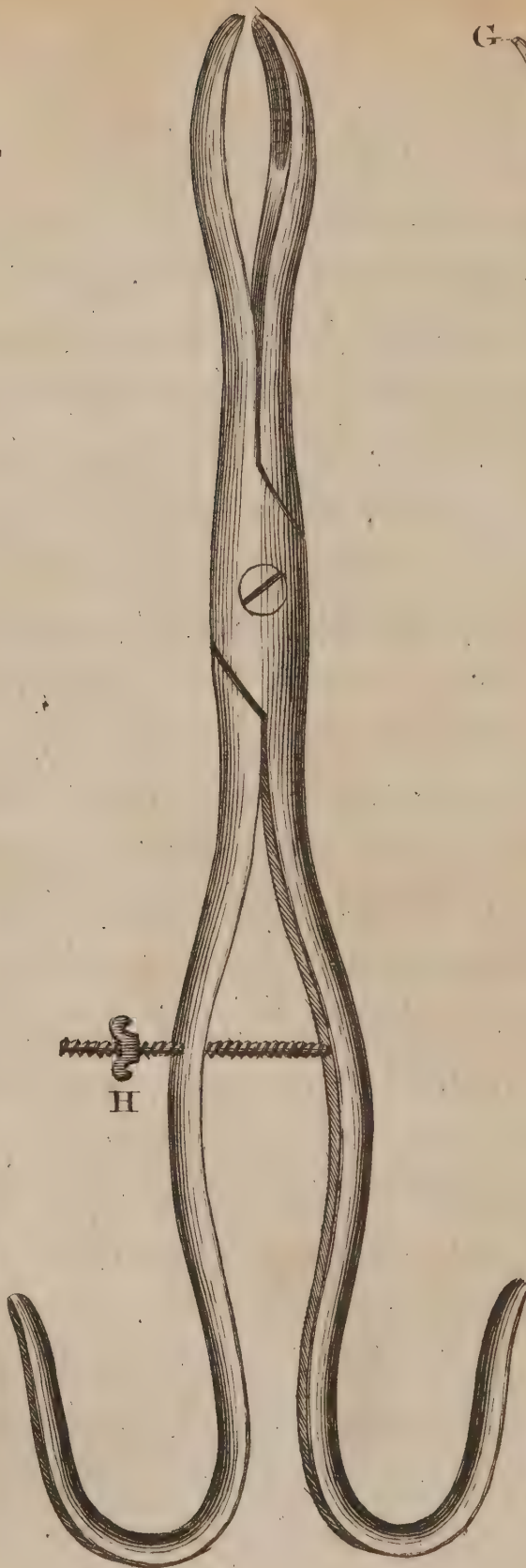
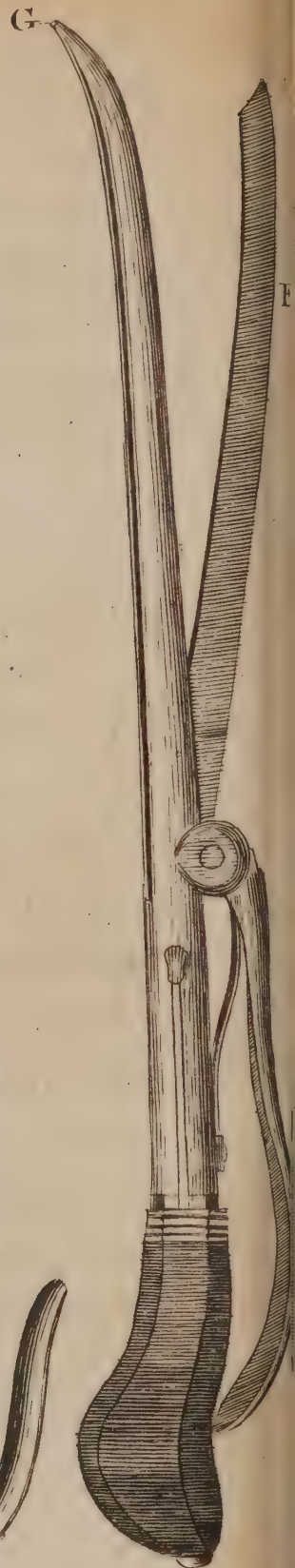


Fig. 2.



in it is evacuated : And the consequences resulting from such an occurrence must frequently, it is obvious, prove very distressful ; as the urine, by not finding a free passage by the wound, will readily insinuate into the contiguous parts, where it must of consequence be productive of very troublesome fistulous openings.

So that although this method of cutting directly into the neck or body of the bladder, is, at first view, extremely plausible, yet the least reflection on these consequences, which frequently result from it, must at once convince every practitioner of the risk attending it being considerable.

The operation of Frere Cosme is, in effect, the same with the real lateral operation, as it is now commonly practised. The parts cut in it are exactly the same, only they are divided in a different manner. After the staff is laid bare in the usual manner, the beak of the instrument, fig. 1. Plate XVIII. is introduced into the groove ; and being pushed forward till it reaches the bladder, the spring C is then to
be

be pressed down, so as to raise the knife from its sheath, when the operation is to be finished, by withdrawing the instrument in such a direction as may divide the neck of the bladder and prostate gland, in the same manner as is done by the common gorget: After this, the other steps of the operation are to be completed in the manner we have already directed, with the forceps alone.

Most of the other deviations from the established mode of practice, hitherto proposed by surgeons, consist, either in some improvement of the cutting gorget of Mr Hawkins', or in a preference which some practitioners still continue to give to the knife. We have already observed, that Mr Hawkins' gorget does not spread sufficiently at the cutting part of it, and that it is much wider and deeper backwards than it ought to be, by which it is liable to tear and otherwise injure the urethra more than is necessary: This inconvenience, however, we think is effectually removed by the cutting-director we have ventured to recommend.

With

With respect to the scalpel being preferred by some operators both to the cutting gorget and director, we have only to observe, that an expert surgeon of steadiness, and possessing a minute knowledge of the anatomy of the parts, may with ease and safety perform the operation of lithotomy with the knife alone; but we must also remark, that, with the generality of surgeons, the danger of wounding the rectum is so great when a scalpel is employed, that the use of the gorget or cutting director, by either of which the intestine is effectually defended, ought to be commonly preferred.

In the course of this section, we have endeavoured to deliver all that is worth recording, of modern practice in the operation of lithotomy: We are not conscious of having omitted any improvements of importance; and some, we hope, are proposed, which are not generally known, or which, if known, are not commonly practised.

As the subject we are treating of is one of the most material in the department of Surgery, we have been induced to extend

the consideration of it to a very considerable length: It may therefore prove serviceable, to students especially, to have such circumstances enumerated in a more concise manner as particularly merit their attention.

1. We have already in strong terms pointed out the propriety of an absolute certainty being attained, of a stone existing in the bladder, before the operation of lithotomy is proposed: And we have endeavoured to show, that no symptoms, however strongly marked, afford sufficient evidence of the presence of calculus; the operation of sounding, or touching the stone with a staff, being the only certain means we have of judging of this matter.

2. In performing this operation, a considerable quantity of urine ought to be previously allowed to collect in the bladder; the rectum should be emptied by an injection; the buttocks ought to be considerably elevated above the rest of the body; and the external incision ought to be more extensive than is commonly advised. In full-grown adults, instead of an inch and a half, or two inches,

inches, as it is generally made, it should be at least three inches and a half long; care being taken to commence the cut at the inferior edge of the pubes, and to continue it in an oblique direction till it has passed the anus, at an equal distance between the extremity of the rectum and the tuberosity of the ischium.

3. As the great resistance frequently experienced in this operation to the extraction of the stone, proceeds most commonly from the muscles covering the urethra, these ought to be freely divided: No danger can ensue from this, and much advantage may be derived from it.

4. But although a free division of the muscles is of much importance, there is no necessity for cutting so much of the urethra as is very commonly done: It does not render the extraction of the stone in any degree easier; and it makes the operation more hazardous than when the membranous part of the urethra only is divided. When the incision is carried through the teguments and muscles so as to leave the

staff covered by the urethra only, the operator ought to insert the index and middle finger of his left-hand into the bottom of the wound, by which means the rectum will be effectually protected; and this being done, an opening should be made into the urethra by piercing it with the point of the scalpel very near to the prostate gland, and extending the incision to the bulb, but no farther. This, we may remark, should be done by one stroke of the knife, and not by repeated applications of it, as is the common practice; for by this means a rugged unequal wound must for certain be produced. In the first part of the operation, the point and edge of the knife ought to be so applied as to cut from above downwards, as in this manner the incision is very easily and safely accomplished; but in dividing the urethra, the back of the knife ought for certain to be turned down, while the edge of it is made to penetrate the urethra, and to run along the fulcus of the staff. By this means the rectum cannot possibly be injured; an occurrence, which, in the usual

usual method of operating, is too frequently met with.

5. The next step in this operation is to divide the prostate gland, with a very small portion of the neck of the bladder. This, we have observed, may be done with much safety and ease with the scalpel alone, by a good anatomist, whose hand is perfectly steady; but as there is a necessity for dividing the prostate gland in such a direction as to avoid the rectum, with which it is posteriorly connected, and likewise the excretory ducts of the vesiculæ feminales which terminate here, much exactness is required to get this accomplished, and it can only be done with safety to these parts by a lateral cut through this gland. A very small variation, it is evident, in the direction of the scalpel, might here be productive of much danger; and few practitioners being possessed of such equal steadiness as at all times to be able to avoid this, for ordinary practice, a knife, constructed in such a manner as to protect the rectum and other parts behind, at the same time that it ef-

fects a lateral division of the gland, ought certainly to be preferred. The gorget of Mr Hawkins is attended with all these advantages; but we have formerly shown, that it is likewise attended with a very material inconvenience. This, we think, is effectually obviated by the cutting director we have already described, which makes a more clean and ample cut than the gorget, at the same time that it does not tear the urethra, as the gorget always does, by being made to expand more behind than is necessary.

6. After the stone is laid hold of by the forceps, it ought to be extracted in a very slow and gradual manner; not by a rotatory motion, or by pressure applied equally in all directions; but by endeavouring to dilate the parts along the course of the wound in a line directly between the anus and the tuberosity of the ischium. Moderate pressure laterally may likewise have some influence: But no force ought ever to be applied towards the upper part of the wound; for nothing can be gained by
doing

doing so, and it must for certain do mischief by pressing the urethra with violence against the pubes. When in the course of extraction it is found, that the passage of the stone is impeded by some of the muscles not having been sufficiently divided, this ought still to be done, by the operator keeping the stone firm in the forceps with one hand, while with a scalpel in the other he effects what is necessary.

7. The stone being extracted, soft easy dressings should be applied to the wound: And the patient should be laid in bed with his head and upper part of the body elevated, in order to facilitate the evacuation of any blood that may be discharged from any arteries that have been cut; and which, by a contrary posture, with the buttocks raised above the rest of the body, is often made to lodge in the bladder, to the great detriment and even hazard of the patient.

Having thus enumerated those points in this operation which deserve most at-

tention, we shall now proceed to consider the operation of Nephrotomy.

SECTION VIII.

Of Nephrotomy.

WHEN one or more stones are impacted in the kidneys, in such a manner as to be prevented from passing off with the urine, they give rise to a train of symptoms which occasion the most complete misery during the life of the patient, and which at last almost constantly terminate in his death.

The severity of the pain produced by stones in the kidney, is frequently so great, as to have induced practitioners to suggest an operation for extracting them. This consists in a cut being made through the common teguments and muscles immediately above the kidney, with an opening into the kidney itself of a sufficient size to afford a free passage for the stone.

But we are to remember, that, however
marked

marked the symptoms of a stone in the kidney may appear to be, it is impossible to obtain an absolute certainty on this point. We know that a stone in the kidney occasions pain in the region of the kidney, together with sickness and vomiting, and a discharge of urine sometimes mixed with blood, and on other occasions with mucus, and even with purulent matter. We also know, however, that the same symptoms are not unfrequently induced by other causes, particularly by inflammation and consequent suppuration of the kidney. Many instances have occurred of the most violent nephritic complaints subsisting for a great length of time, where stones were suspected as the cause of them; but where, upon dissection, instead of this, the kidney has been found to be completely suppurated, and as it were entirely dissolved, a quantity of purulent matter being contained within its external covering.

Even in the case of calculus of the bladder, a disorder less ambiguous than the nephritis calculosa, the symptoms are never so distinct

distinct and characteristic as to render the operation of lithotomy advisable, unless a stone is discovered upon the introduction of a sound. But in affections of the kidney, suspected to originate from stone, we are deprived of this means of ascertaining its presence ; so that it might not unfrequently happen, that, after laying open the kidney, no stone would be discovered. This is, therefore, an objection, and a very important one, to the operation in question.

But it is to be farther observed, that the kidneys do not lie near the surface of the body ; that although they are not altogether covered by the inferior false ribs, yet these ribs project so much over them, as to prove a considerable obstacle to an operation ; and that, in people who are corpulent, the kidneys are very thickly covered indeed.

For these reasons, it is impossible to make an opening into the kidney with so much accuracy and precision, as the near contiguity of the neighbouring large blood-vessels would require ; and whoever attempts

tempts the operation of nephrotomy, even on the dead body, will find it a difficult matter to cut into the pelvis of the kidney without opening some of the large blood-vessels belonging to it: The very great and immediate danger from such an accident is too manifest to require to be farther mentioned.

When, indeed, the inflammation, induced by a stone in the kidney, terminates in an abscess, and when the matter thus collected forms a tumor in which a fluctuation is distinguished, little or no danger can ensue from opening it: And in such an event the stone which produced the tumor will either be discharged along with the matter; or it may, if it can be laid hold of, be afterwards extracted with safety.

The stone being thus taken out, the opening through which it passed, will either heal by the usual means employed in the treatment of abscesses in other parts; or the most unfavourable termination that can probably happen, will be a fistulous sore,
through

through which a mixture of pus and urine will continue to be discharged.

Upon the whole we may conclude, that when we are not directed by the appearance of a tumor to the part which ought to be opened, the uncertainty of the ground upon which we proceed when we undertake this operation,—the difficulty of performing it,—and the very imminent danger which attends it, will more than counterbalance any advantage which can ever be expected to be derived from it; and that for this reason the operation of nephrotomy will never probably be received into general practice, however much it may be recommended by some writers, and warmly supported by others, who, in order to raise a reputation which they might not otherwise obtain, will sometimes step forward and propose with confidence what no practitioner of character would think right to attempt*.

S E C-

* For farther information on the subject of Nephrotomy, see Roffetus de partu Cæsareo, cap. vii. sect. 4. Philosophical Transactions for the year 1696. Schenkus Obser-

SECTION IX.

Of Stones in the Urethra.

IT is not an unfrequent occurrence for patients liable to calculous complaints to pass small stones along with their urine. When the stones, in such instances, are smooth and not very large, they usually come off with little or no difficulty; and in some cases stones of a very considerable size have been passed without producing much pain. But when an angular or rough stone is pushed into the urethra, if it is not so small as to pass easily off with the first flow of urine, it is sure to create a great deal of distress.

Pain is the first symptom produced by a stone lodged in the urethra; and to this succeed inflammation, tumefaction of the parts,

vat. Med. lib. iii. Juncker's Conspect. Chirurg. tab. 93. Edinburgh Medical Essays. Memoires de l'Academie Royale de Chirurgie de Paris.—And Mery's Observations sur la Maniere de Tailler.

parts, and always a partial and frequently a total suppression of urine. In some instances, when the disorder is long neglected, this suppression and consequent tumefaction terminate in a rupture of the urethra; in consequence of which, the urine escapes into the contiguous cellular substance, and very troublesome swellings are produced not only in the body of the penis, but frequently in the scrotum, and thro' the whole course of the perinæum.

The treatment suited to such tumors will be pointed out when we come to treat of fistulous sores in these parts; we have now only to relate the easiest and most effectual means of discharging the stones which are lodged in the urethra. As soon as it is known that an obstruction is formed in the urethra by the stoppage of a stone, the nicest attention becomes requisite in order to procure its removal.

When a stone has been long fixed at one particular part without yielding in any degree, and when the pain and inflammation produced by it are considerable, a surgical

gical operation ought to be immediately employed for removing it ; but in the incipient stages of this disorder, other means of a more gentle nature should be first put in practice.

Whether or not the urethra itself is possessed of any contractile power, is a point not easily to be determined : But the muscles with which it is immediately connected, are in common with other muscular parts subject to the influence of stimuli ; and as nothing with which we are acquainted, can be supposed to give a more powerful stimulus to a sensible part than the irritation of a rough or angular stone, so we may fairly conclude, that when once a stone is impacted in the urethra, its farther passage along that canal may very possibly be impeded by a spasmodic contraction of some of the contiguous muscles. One very important indication, therefore, in the treatment of this malady, is, the removal of spasm ; and when we keep this idea in view, and continue to persist in the use of proper remedies, we seldom fail
to

to bring off such stones as have been lodged in the urethra, without the aid of any surgical operation. But, instead of the application of means calculated for the removal of spasm, the ordinary practice of surgeons is the direct reverse of this, and must frequently be attended with a very opposite effect.

An attempt is commonly made to push the stone forward at once with the fingers. It is obvious, however, that until the spasm which in part produces the obstruction, is removed, every trial of this kind will rather tend to increase the complaint. For this reason, therefore, no pressure ought to be used till the most effectual means have been employed for removing the spasm produced by the stone. With this view, the patient, if he is plethoric, ought to lose a considerable quantity of blood by the lancet; or, if he is thin and emaciated, a proportionable quantity should be discharged by leeches, directly from the part affected. A quantity of warm oil should be repeatedly injected into the urethra, in order to lubricate the
passage

passage as much as possible.—The patient should be immersed in a warm bath,—and a full dose of laudanum should be at the same time exhibited.

Together with these remedies, a plentiful use of diuretic medicines, and of diluent drinks, is commonly prescribed: But, instead of being productive of any advantages, they almost constantly do harm. For, when the urine rushes out with violence, if it does not carry the stone freely out of the urethra, it will tend to fix it more firmly than before; and the pain thus produced, will always increase the inflammation, tension and spasm of the parts affected: So that whatever has much effect in increasing the quantity of urine should be carefully avoided.

A proper quantity of blood having been discharged; the patient having remained for a sufficient length of time in the warm bath; and the opiate having begun to operate; the parts will thus be as completely relaxed as possible: And this is the period when some attempt should be made

for extracting the stone.—Various instruments have been contrived for this purpose, particularly long small pliers or forceps concealed in a canula of a size corresponding to that of the urethra; but as none of these have ever proved in any degree useful, and as they often do much harm by producing an increased irritation in the urethra, we do not think it necessary to delineate them.

In place of using instruments of this kind, a surgeon ought at first to endeavour by very gentle pressure to push the stone forward along the course of the urethra. In this manner large stones may be brought off, for the removal of which a very painful operation might otherwise be necessary. Indeed, stones of so very considerable a size have been sometimes passed by the urethra, as ought always to induce practitioners to persevere for a considerable time in the employment of the more gentle remedies we have recommended, before advising any other means of relief.

It

It frequently happens, however, that stones of such a size and figure get into the urethra, as cannot by any means be made to pass to the extremity of that canal. When a stone, thus fixed in the passage, is of such a form as to admit of the discharge of the urine, a patient, rather than submit to an operation, is sometimes induced to allow it to remain; and when he does so, the stone, in a short time, commonly obtains an increase of size by a deposition of earthy matter from the urine: I have known different instances of this in which the stones have become very large, and in which the urethra was so dilated as to form an extensive pouch or cavity corresponding to the size and figure of the stone. But when the stone, instead of allowing any of the urine to pass, fills up the urethra entirely, it then becomes necessary to have immediate recourse to an operation as soon as the means we have already recommended are found to prove ineffectual.

This operation consists in cutting directly upon the stone, and extracting it either

with a scoop, or with a pair of small forceps; but the methods of effecting this vary according to, and depend upon, the part of the urethra in which the stone is fixed. When a stone is situated near to the beginning of the urethra, and very contiguous to the bladder, it has been advised to push it again into the bladder by means of a staff: But as it might there probably acquire a much larger size, and would consequently render the patient liable to all the distress usually produced by a stone in the bladder, this is a practice which ought by no means to be admitted, as the stone may be extracted with much more ease from any part of the urethra, and with much less hazard to the patient, than is commonly incurred by the more formidable operation of cutting into the bladder.

When, therefore, an operation is necessary for extracting a stone fixed in the urethra near the neck of the bladder, the method of performing it is this.

The patient ought to be laid upon a table, and secured in the manner we have directed

directed for the operation of lithotomy : And an assistant suspending the scrotum and penis, the surgeon, after oiling the first and second fingers of his left-hand, should introduce them into the anus, and by means of them ought to press firmly upon the parts immediately behind the stone ; which will not only enable them to lay it bare with more ease, but will be the surest method of preventing it from being pushed into the bladder by the necessary pressure of the knife. This being done, an incision should be made through the common teguments and urethra, so as to lay the stone completely bare ; which may now be either turned out by a due degree of pressure applied with the fingers in the rectum ; or, if this is not found to be sufficient, it may be taken out either with a scoop or with a pair of forceps.

The after treatment is the same here as we have directed in the operation of lithotomy.

When, again, a stone has passed farther in the urethra, in order to extract it, the

skin ought to be drawn as much as possible past it, either in a backward or forward direction ; and the stone being now secured in its situation by pressure, a longitudinal cut is to be made directly upon it through the urethra, of a sufficient size to admit of its easy extraction either with the scoop or forceps. The edges of the wound are now to be completely cleared of fabulous particles, and the skin allowed to regain its natural situation : By which means, if the operation has been properly done, the wound in the urethra will be entirely covered by skin that has not been injured : a circumstance which tends to render this operation much less formidable than it otherwise would be ; for the wound in the urethra is thus so well protected, that it commonly heals by the first intention.

It sometimes indeed happens, that in voiding urine, part of it escapes at the wound, and insinuates itself into the contiguous cellular substance. This is, however, a rare occurrence, and the inconveniences arising from it are easily obviated by
laying

laying open any collection of urine which may take place during the cure.

When a stone fixes near to the point of the yard, as it sometimes does ; if it is so near as to be observed by the eye, it may frequently be taken out with a pair of small dissecting forceps : And in order to facilitate the extraction, when it cannot be otherwise effected, the urethra may be somewhat dilated from its extremity with the point of the scalpel. But when we fail of success in this way, an incision must be made upon the stone in the manner we have directed where the urethra is covered with skin. Soft dressings should be applied to the wound ; and when the cure is nearly completed, a hollow bougie, a short silver tube, or a small catheter of the elastic gum, should be introduced into the urethra, in order to preserve it of a proper size.

The most perplexing situation in which a stone can be fixed in the urethra, is just below the scrotum ; for if the stone either make its way into the scrotum, or if it is necessary to make an opening into it with

a scalpel, such large collections of urine are apt to occur, as commonly occasion much distress.

In order, therefore, to obviate this inconvenience, as soon as a stone is discovered in this situation, the greatest attention ought to be given, either to get it carried farther into the urethra, or, if this cannot be effected, to push it back into the perinæum by means of a staff. By a due perseverance in the means we have recommended, this will very commonly be effected: But when it is found to be impracticable, and that there is a necessity for extracting the stone, an incision must be made into the urethra, by beginning the cut at the under part of the scrotum, immediately to one side of the septum, and continuing it upwards till the stone is distinctly felt, when it is to be laid bare and extracted in the manner we have already directed.

By making the incision from below upwards, any urine that escapes from the urethra finds a very free passage; and if the opening is made sufficiently large, the
stone

stone may be in this manner easily extracted. During the operation, care must be taken to have the testis of that side on which the cut is made as much protected as possible, by an assistant pulling it away from the knife; and when this is properly done there is no danger of the testicle being injured. Some attention is necessary after the operation in applying the dressings in such a manner, that the sore may heal first at the bottom; for if this circumstance be not kept in view, and if the teguments are allowed to heal before every vacancy in the parts beneath is filled up, purulent matter, and perhaps urine, will very probably be collected, and may thus give rise to troublesome sinuses.

When urine continues to be discharged for any length of time at a preternatural opening of the urethra, whether the consequence of the operation of lithotomy or of any other cause, if the calculous diathesis prevails, stones of a large size will frequently form in the cellular substance contiguous to the opening. I have met with
several

several instances of this : In some of them, the stones were small and easily extracted ; but in others they were found to occupy a considerable portion of the cellular membrane, and to occasion a good deal of trouble in taking them entirely out *. The treatment here consists solely in making a free incision along the course of the calculous concretions ; in turning them out, either with a scoop or a pair of forceps ; and in dressing the wound properly, so as to induce a firm adhesion of the parts beneath, before the external teguments are allowed to heal.

In females, the urethra is so short, and dilates so readily, that small stones seldom stop in it : They are most commonly carried off by the flow of urine which brings them into it ; but when they happen to fix in it, they are commonly turned out with much ease, merely by the end of a blunt probe

* A very remarkable case of this nature is recorded by Gooch. See Cases and practical Remarks in Surgery, Vol. ii. p. 174. by Benjamin Gooch.

probe being insinuated behind them, and then pulled forward : Or, when this does not succeed, it may always be effected with safety, by cutting upon the extremity of the urethra, so far as to admit of the introduction of a pair of small forceps by which the stones may be extracted.

C H A P. XII.

Of Incontinence of URINE.

INCONTINENCE of urine may be produced by various causes ; but as it is frequently connected with calculous complaints, and is in some instances the consequence of the operation of lithotomy, we are hence induced to take the subject under consideration in this place.

The

The ordinary causes of this malady may be reduced to the following heads :

1. Irritation about the neck of the bladder, produced by the friction of the stones contained in it. Thus we know, that inability to retain urine is a very frequent symptom of stone in the bladder ; and we cannot suppose this to proceed from any other cause than the constant stimulus communicated by the stones to the coats of the bladder. For, if it always originated, as has been supposed, from a total loss of power in the sphincter vesicæ, the disease would seldom or never admit of a cure. But we know well, that an incontinence of urine, depending upon a stone in the bladder, is very commonly removed entirely by the operation of lithotomy : And we likewise know, that it is very frequently much relieved, even when the stone remains in the bladder, by the use of those remedies which most effectually remove irritability ; particularly by a plentiful use of mucilaginous drinks, and by a free use of opiates. Indeed, by a continued use of these

these remedies, this variety of the disease is commonly more effectually removed than by any other means, extraction of the stone excepted; which, when these fail, is to be kept in view as the only resource upon which we are to depend.

2. A constant stillicidium, or incontinence of urine, is a frequent consequence of paralytic affections; and it would appear, that the sphincter of the bladder now and then loses its contractile power, while the natural tone of its body, or of the muscle termed *Detrusor Urinæ*, remains entire. In this variety of the disorder, the obstinacy of the paralytic affection with which the constitution in general may be attacked, commonly renders fruitless every attempt to remove it. But the most obvious remedies to be employed for it, are, tonics, particularly Peruvian bark, chalybeates, and especially the cold bath general and local. In every affection of this kind, the local application of cold to the perinæum has more influence than any other remedy. Cloths wet with vinegar and cold water, or
with

with a strong solution of saccharum saturni in vinegar, are sometimes of use; but the most effectual method of applying cold, is by dashing water directly from the fountain upon the perinæum and fundament.

3. An incontinence of urine is not an unfrequent consequence of laceration produced in the operation of lithotomy in male subjects; and in the same operation, and by violence done to the parts in delivery, in females. It ought to be remembered, however, when in the lateral operation of lithotomy much laceration is produced, that in general it proceeds from the muscles and other parts not having been freely enough divided by the knife: And accordingly, except in cases of exceeding large stones, this inconvenience of an incontinence of urine seldom succeeds to this operation, when it is properly performed.

As the disease in this case depends upon nearly the same cause as the one last mentioned, namely, on a loss of power in the retaining parts, the same remedies become

Fig. 1.

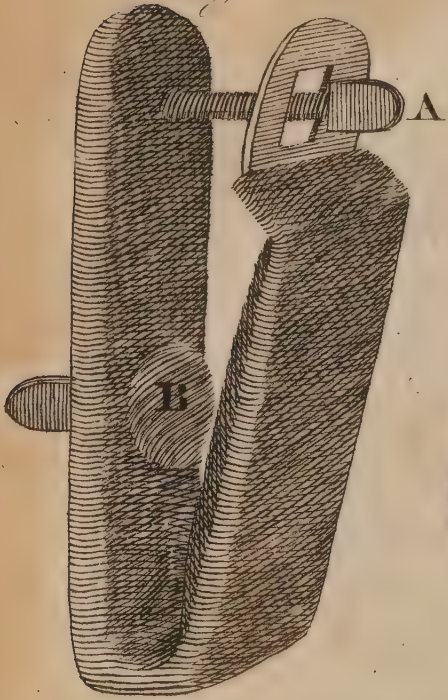
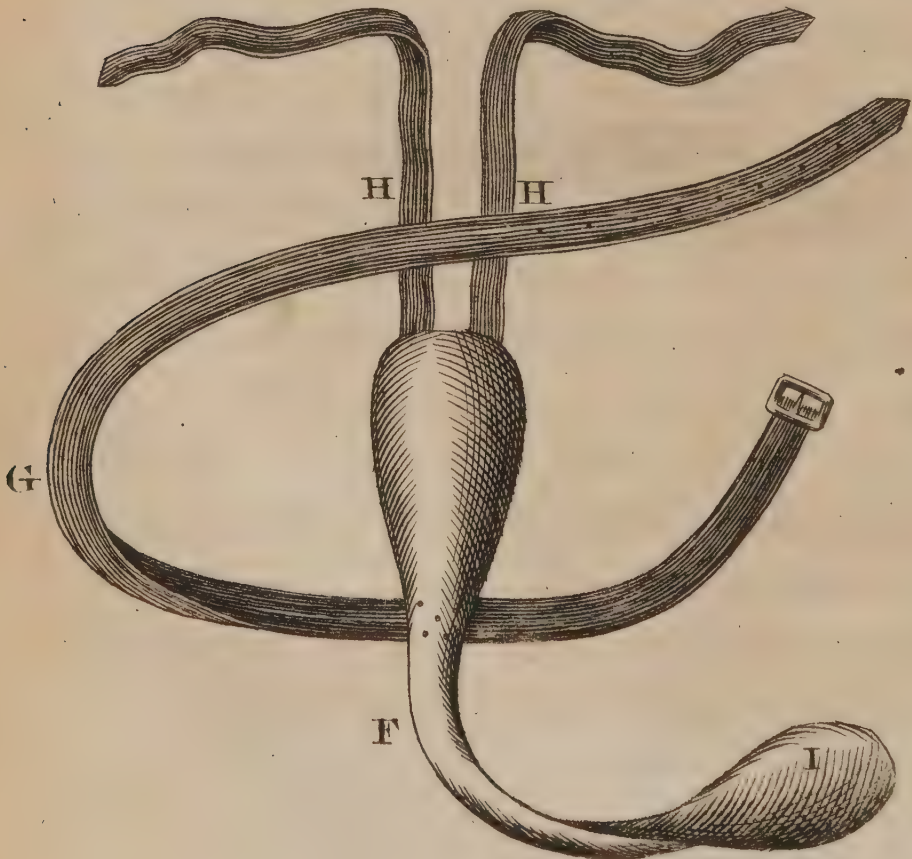


Fig. 2.



Fig. 3.



A. Bellefleur.

become necessary ; and by a due perseverance in the use of these, particularly of cold bathing, many are at last very effectually relieved from this species of the disorder. But it does frequently happen, in every variety of the disease, that no relief is obtained from any remedy whatever ; in which case, it becomes an object of importance to prevent the urine from incommoding the patient, which it does in a very distressing manner, if some effectual means are not employed to guard against it.

When the disorder proceeds from either of the two last mentioned causes, namely, from a paralysis of the sphincter of the bladder, or from laceration, compression of the urethra answers very effectually for preventing any inconvenience produced by it, as the pressure can be so modified as to be applied and removed at pleasure. Nuck invented the first instrument for this purpose that we find any description of. The Jugum, or Yoke, as it is termed, in Plate XIX. fig. 1. is an improvement upon this ;

this ; and, when properly fitted, it answers the purpose exceedingly well. When lined with quilted silk or velvet, it fits easily on the penis, and by means of the screw, the pressure can be made of any degree of tightness. For women another invention becomes necessary, as the pressure here must be applied through the vagina. Pessaries of sponge have been invented for this purpose ; but, when the parts are not so irritable as to prevent the application of them, nothing answers so well as the ordinary pessaries of ivory, or of any solid timber, such as *lignum vitæ*. In Plate XX. are represented pessaries of different sizes.

In the introduction of these instruments, care should be taken to have them very finely polished, and they should likewise be well covered with oil. After being fairly passed into the vagina, the pessary should be placed directly across, so as to press with as much effect as possible against the urethra.

This method of obviating the inconveniences produced by an incontinence of urine, by pressure, is not, however applicable

Fig. 1.

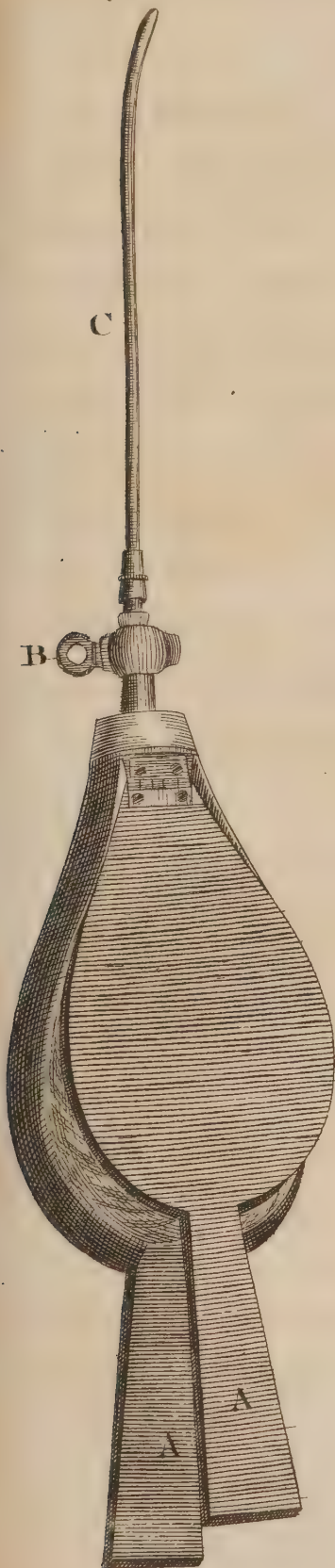


Fig. 2.

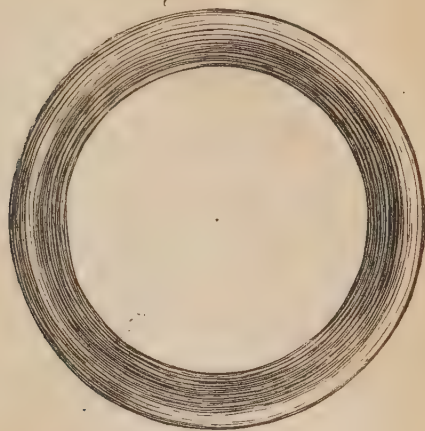


Fig. 3.



Fig. 4.



A. Bell Sculp^t.

cable when the disorder proceeds from irritation about the neck of the bladder ; for the continual desire to pass water, with which patients in such circumstances are constantly tormented, renders every attempt to suppress a complete evacuation of it totally inadmissible. It is therefore a matter of importance for practitioners to attend to the different causes by which the disorder is produced : For it is evident that a remedy well calculated for one variety of the disease may prove very prejudicial in the others.

In all such instances where pressure upon the urethra is found to be improper, much relief may be obtained by having a machine properly fitted to serve as a reservoir for the urine. The instrument formerly referred to, represented in Plate XIX. has been used by different people, and with much advantage. It ought to be made so as to apply as closely as possible to one of the thighs ; and when properly fixed to a circular bandage round the body, it commonly remains sufficiently firm, and at

the same time admits of a change of posture in an ordinary exertion of the body. Instruments of this kind, however, prove useful only in men. In women, all that can be done is, to apply sponge and soft linen in such quantities as will effectually absorb the urine as it passes off.

By one or other of the methods here pointed out, most of the inconveniences induced by this disorder may be much obviated; and in course of time it frequently happens, that when the original causes which produced it are removed, the disease itself is at last completely cured.

C H A P. XIII.

Of a Suppression of URINE.

THE disorder treated of in the last chapter, namely, an Incontinence of Urine, is always attended with some inconvenience; but the disease now under consideration, proves, in every instance, very alarming, and on many occasions is productive of more real misery than almost any other to which the human body is liable*.

M 2

Various

* It is that species of the disease we here mean to consider in which the urine is collected in the bladder, but which by some impediment or other, is prevented from being evacuated. When this discharge is suppressed by any affection of the kidneys, a variety of the disease is produced, which it is not in the power of any surgical operation to relieve; so that the consideration of it does not belong to our department.

Various causes tend to the production of this disorder ; and in the treatment of it, a nice discrimination of them is necessary.

1. In the preceding chapter we have seen, that an incontinence of urine is often produced by the sphincter of the bladder becoming paralytic, while the detrusor urinæ still retains its power of contraction. In a similar manner, a suppression of urine frequently occurs in paralytic disorders, and seems to originate from loss of power in the body of the bladder, while the sphincter still preserves its usual power of retention.

Altho' this species of the disease is often connected with a paralytic affection of all the under part of the body, yet it is frequently induced by the pernicious custom of people remaining too long, especially when drinking freely of diuretic liquors, without voiding urine ; by which means, the bladder is sometimes so over-distended, as to lose entirely all power of contraction. In this variety of the disease, the catheter
is

is commonly found to be a very certain remedy ; and as in cases of this kind it is generally easily introduced, it ought always to be employed as soon as the suppression is evidently formed ; and as a complete cure of the disorder will be more readily obtained by avoiding the cause which produced it, namely, an over-distention of the bladder, than by any other means, this circumstance ought to be very particularly attended to. When, therefore, the least inclination to void urine is felt while the inability to discharge it continues, the catheter should be immediately employed. For although the introduction of the catheter is always disagreeable, and should never be attempted but when necessity points it out, yet in such circumstances as we are now considering, much delay or caution on this point might frequently prove very detrimental. The method of introducing the catheter, both in male and female subjects, is the same with the operation of sounding for the stone, which we have already described.

2. A suppression of urine frequently occurs in the last months of pregnancy, from the uterus, during that period, pressing much upon the neck of the bladder. So effectually indeed does this pressure of the womb obstruct the passage of the urine, as on many occasions to prevent the evacuation of a single drop, unless the catheter is used: And as this instrument is in females commonly introduced with much ease, it ought always to be employed when any difficulty in voiding urine is perceived. By delaying the use of the catheter too long, much distress is frequently incurred. In different instances, the bladder has from this cause been distended to such a degree as to lose entirely its power of contraction; and in a few cases, even a complete rupture of its coats has been produced.

As soon, therefore, as any necessity occurs for the use of the catheter, by the bladder being much distended, it ought to be regularly employed.

Tumors in the vagina and neighbouring parts, when they happen to arrive at any considerable magnitude, have frequently
the

the effect of compressing the urethra so much as to induce a total suppression of urine; and it is not an unfrequent consequence of a prolapsus uteri.

The method of treatment best calculated for a complete removal of a prolapsus uteri, as likewise the means of cure commonly employed in cases of tumors in the vagina, will be the subjects of different chapters; only it must be remembered, that till these views are accomplished, the urine should in the mean time be regularly drawn off with the catheter, whenever it is found to be collected in any considerable quantity.

The very irritable state of the parts about the neck of the bladder, which often prevails in cases of suppression of urine, renders it necessary in some instances to employ the catheter often. Instead of this, some practitioners have advised the common catheter to be allowed to remain in the bladder a considerable time at once, so as to admit of the urine being evacuated as quickly as it is secreted: But this is a

practice which ought by no means to be admitted; for the irritation produced from a long continuance of this instrument in the bladder, commonly does more harm than is ever experienced from a frequent introduction of it. When it is wished, however, to allow a catheter to remain in the bladder, either for this purpose, or in cases of wounds in the urethra, the hard silver tubes in common use ought not to be employed; a flexible instrument of this kind, prepared with the *Resina Elastica*, is found to answer this intention better than any other.

3. A stoppage to the flow of urine is not an unfrequent consequence of schirrosities of the prostate gland, and of obstructions formed in the urethra in cases of virulent gonorrhœa. The treatment best suited to these affections will also be the subject of a different chapter.

That species of suppression of urine induced by stones impacted in the urethra, has been already treated of, and the remedy pointed out.

4. But

4. But the most alarming variety of the disease is that which proceeds from inflammation about the neck of the bladder, inducing pain and such a degree of swelling in the parts as renders the introduction of the catheter inadmissible.

Suppression of urine from an inflammatory affection of the neck of the bladder, is not unfrequently found to originate from inflammation in cases of gonorrhœa proceeding backwards along the course of the urethra: An improper use, too, of astringent injections has frequently induced this species of the disease; and as the bladder is equally liable with other parts of the body to the influence of those causes which induce inflammation, whatever has any effect of this kind in other parts will be productive of the same consequences here.

The method of treatment is nearly the same, by whatever cause the inflammation may have originally been induced. Blood should be discharged in a considerable quantity from some of the larger vessels, and leeches ought to be applied
upon

upon the perinæum as near as possible to the seat of the disease. Opiates should be prescribed in large doses; injections of warm water or milk should be repeatedly thrown up by the rectum; and the whole body should be immersed in the warm bath. By these means, when the causes inducing the disorder is not of an obstinate nature, the inflammation producing the suppression of urine will sometimes be removed before any troublesome symptoms supervene. But when they do not prove effectual; when the bladder becomes painfully distended; and when every attempt to introduce the catheter has failed, some other means ought to be immediately employed for relief. With this view, nothing in such circumstances is to be depended on, but puncturing the bladder in order to discharge the urine collected in it.

Various methods have been proposed for effecting this operation.—By some it has been advised to puncture the bladder a little above the pubes; others have proposed to cut the membranous part of the urethra,

urethra, prostate gland, and neck of the bladder: And an opening from the perinæum, directly into the body of the bladder, has been likewise recommended *. It is not necessary, however, in order to reach the body of the bladder, to lay the urethra open, and to divide the prostate gland: This method, therefore, of removing a suppression of urine, is now very deservedly laid aside.

Puncturing the bladder above the pubes, has been recommended by many respectable authors, particularly by the late Mr Samuel Sharp; and as it is still practised by many in preference to every other method, we shall here describe the method of doing it.

There is no difficulty in perforating the bladder in this place; for if an opening be made anywhere within two or three inches of the upper part of the pubes, if it be carried deep enough, it must of necessity, in this distended state of the bladder, be sure to reach it: But the best situation

* *Vide* the Works of Saviard, Tolet, and Colet.

tion for entering the perforating instrument, is about an inch or an inch and a half above the symphysis of the pubes.

We are directed by writers upon this subject, first to make an incision of about two inches in length through the common teguments and muscles, and then to perforate the bladder with a trocar. But there is no necessity whatever for this extensive division of the teguments and muscles; for the operation may be done with equal safety, and with much less pain to the patient, by merely pushing a trocar at once through the skin, muscles, and bladder. As soon as the trocar has fairly entered the bladder, the stilette should be withdrawn, and the canula secured in its situation by pieces of ribbon or tape connected with it, and made fast round the body of the patient; and a piece of cork ought to be fitted to the canula, that the urine may pass off at proper intervals only, by which means alone the patient can be kept dry and comfortable.

In corpulent people, a trocar, with a canula two inches long, is found to be necessary;

cessary; but in others the instrument need not be longer than an inch and a half. This circumstance, it may be remarked, is of some importance, and ought to be attended to; for when a long canula is used, and more especially when the puncture is made very contiguous to the pubes, there is always some risk, upon the evacuation of the urine, of pain and distress being produced by the pressure of the canula upon the back part of the bladder. Of this we have an instance on record, in which the extremity of the instrument was found, after death, to have penetrated not only the back part of the bladder, but even the rectum*.

The canula, it must be remembered, is to be retained in its situation till the cause which produced the obstruction is so far removed that the patient can void his urine in the usual manner; but it has been very properly remarked †, that a canula cannot be kept above ten or fourteen days in the bladder, without contracting such a calculous

* Vid. Sharpe's Operations of Surgery, chap. xv.

† Vid. Critical Enquiry, &c. by Mr Sharpe, ch. iv.

calculous crust, as renders its extraction exceedingly difficult, and, in some instances, even impracticable. The canula, therefore, should be taken out and cleaned every two or three days ; but, previous to withdrawing it, a firm probe of a sufficient length ought to be passed through it into the bladder, upon which it may be again returned with ease and safety as soon as it is properly cleared of the incrustation.

To this mode of operating, however, some objections occur. From the situation of the canula above the pubes, the bladder is suspended by it for a considerable length of time, and is thereby liable to suffer. Besides, if the bladder slips off from the extremity of the canula, the operation must either be repeated, as, we are told by Daran, was once done, or the patient must be left in nearly the same state in which he was previous to the puncture being made.

If, on the other hand, we consider the advantages attending the mode of puncturing the bladder from the perinæum, namely, that it is done with great ease ;
that

that the urine contained in the bladder is more readily evacuated than by puncturing above the pubes ; and that it is likewise less liable to escape into the neighbouring parts ; we will have no hesitation in giving it the preference, in perhaps every instance of suppression of urine.

With a view to puncture the bladder from the perinæum, the patient ought to be laid upon his back ; and his thighs being properly separated and secured by assistants, an incision should be made of about an inch and a half in length, beginning at the commencement of the membranous part of the urethra, and continuing it towards the anus, in a line parallel to, but at least half an inch distant from, the rapha perinæi. In this manner the skin and cellular substance ought to be freely divided ; which puts it in the power of the operator not only to introduce the trocar with more ease, but to avoid the urethra with much more certainty than he otherwise could do.

This being done, as the bladder is always much distended when this operation
is

is necessary, it will be very easily distinguished by pressure at the bottom of the wound : But, whether it should be felt by the finger or not, there need be no hesitation in pushing in the trocar a little above and to the left of the prostate gland, which, if the parts have been freely divided, may be always discovered ; and if the point of the instrument be directed a very little upwards, there can be no danger of wounding either the ureters or vasa deferentia, which some have been afraid of in this operation ; and at the same time there must be an absolute certainty, if the trocar is carried deep enough, of its reaching the bladder.

It has been alleged, and with some reason, that in this part of the operation the surgeon must be at some loss to know when the instrument has reached the bladder ; and several inventions have been proposed to obviate this inconvenience. In Plate XXI. fig. 4. is represented a very simple contrivance for this purpose : It consists of a trocar, with a canula of the usual form, and a deep groove in the stilette, so that urine begins
to

Plate XXI.

Fig. 2.



Fig. 1.

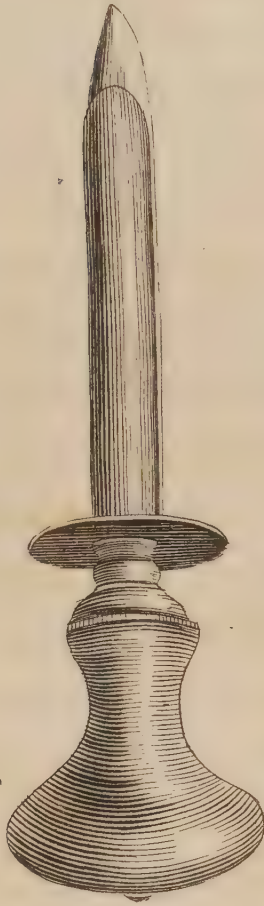


Fig. 4.

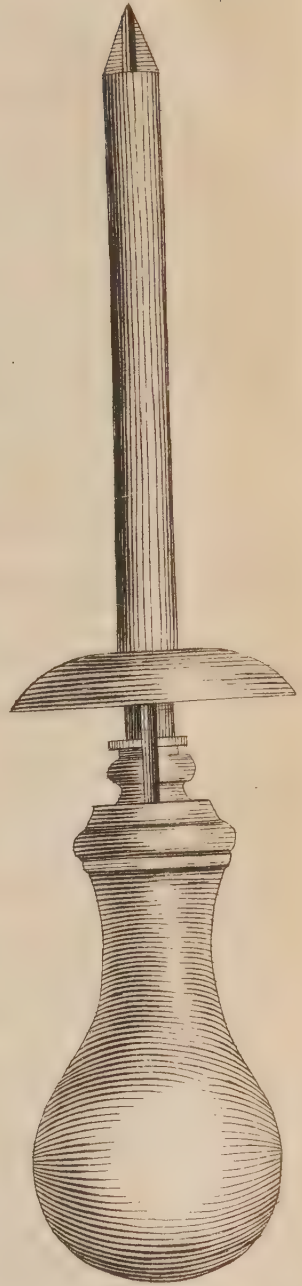


Fig. 3.

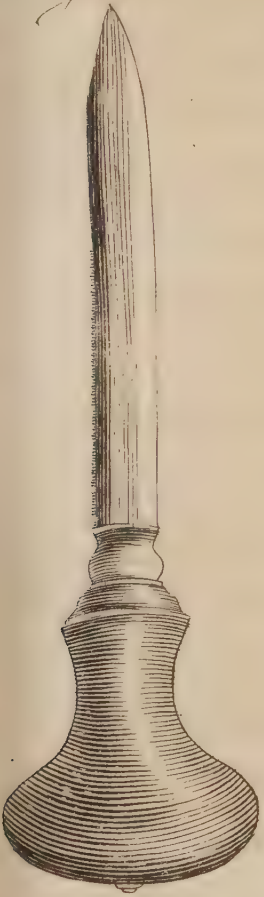


Fig. 5.



to flow along the groove, immediately on the instrument having entered the bladder. As soon, therefore, as by this circumstance it is known that the trocar is properly introduced, the filette should be withdrawn; and the canula should be secured in its situation by two pieces of tape, connected with two rings upon its brim, being firmly tied to a circular bandage round the patient's body: And if one of these tapes be tied behind immediately above the sacrum, and the other directly above the pubes, the canula will not be easily displaced.

It is equally necessary here as when the operation is done above the pubes, to change the canula, or at least to clean it every now and then; and in this situation too, so long as the canula is found to be necessary, the urine may be retained and drawn off at pleasure, by a plug of cork properly adapted to the canula.

In treating of this operation we have not mentioned a method that has been proposed of perforating the bladder by means of a curved trocar entered from the rectum.

Indeed it scarcely deserves to be noticed, as no advantages can probably occur from it, that may not with more certainty be obtained from perforating in the perinæum; and it is attended with this very material inconvenience, that by passing the instrument in at the back-part of the bladder, much risk must be incurred of wounding either the ureters, vasa deferentia, or vesiculæ feminales; while at the same time a passage will be formed by which the fæces may find access to the cavity of the bladder, and by which much misery may be induced: Without further consideration, therefore, we can with freedom venture to say, that this method of operating ought never to be employed.

In the operation of lithotomy in females we assigned reasons, which appear to be sufficiently conclusive against the method of cutting into the bladder from the vagina; but these reasons do not apply with equal force against the propriety of puncturing in this part. On the contrary, whenever there is any necessity for performing this operation in women, it cannot possibly be
done

done in any other way, either with so much ease or certainty, as from the vagina. When the bladder is much distended with urine, it is readily discovered by the finger from the vagina; and from this circumstance it may with great safety be perforated with a trocar. The fore-finger of the left-hand being introduced into the vagina, the point of the instrument ought to be conducted upon it, and should at once be pushed thro' the vagina into that part of the bladder which is first discovered by the finger; for here the ureters run no risk of being wounded, which farther back they certainly would do. After the trocar is fairly introduced into the bladder, and when the urine is all evacuated, the canula ought to be left in its place, and should be continued there as long as the cause subsists which produced the suppression. That the canula may be firmly secured, it ought to be of a sufficient length for passing out at the vagina, and to admit of its being tied to the T-bandage by means of tapes properly connected with it.

C H A P. XIV.

Obstructions in the URETHRA.

IN the preceding section, when treating of the causes of suppression of urine, obstructions produced by claps, of which caruncles are supposed to be the most common, were mentioned as the most frequent and most remarkable.

But although we have particularly mentioned the term Caruncle, by which is meant a fleshy excrescence arising from the membrane of the urethra, we are by no means convinced that it is a frequent occurrence. That such excrescences are sometimes met with, particularly towards the extremity

extremity of the yard, there is no reason to doubt; but as I have had many opportunities of dissecting these parts, in patients who had long laboured under symptoms supposed to proceed from caruncles in the back-part of the urethra, and as caruncles were not in any of these found to be the cause of the disorder, I am therefore clearly of opinion that their existence in the more remote parts of the urethra is a very uncommon occurrence. I have often observed productions of this kind, within half or a quarter of an inch of the extremity of the urethra, especially in cases where the glans and prepuce have been covered with warty excrescences of a similar nature: But from having never, even in cases of this kind, found them spread farther up the canal, although it is not a proof that they never occur in other parts of it, yet this, together with some observations of a similar nature by Dionis, Saviard, Mr Petit, and others, is sufficient authority for the opinion we have advanced,

N 3

vanced, that caruncles in the more remote parts of the urethra is a circumstance rarely met with. Daran indeed speaks much of this species of obstruction; and he no doubt had more practice in disorders of this nature than perhaps ever fell to the share of any other individual: But if he is properly attended to, it will be found, that his ideas on this subject are by no means accurate; for he evidently confounds other causes of obstruction, particularly callous strictures and cicatrices of old ulcers, with, and mistakes them for, caruncles.

Practitioners in former times, as well as many in more late periods, have doubted so little of the frequent occurrence of caruncles, that almost every instance of obstructed urethra succeeding to a clap has been attributed to this cause. What we have here advanced, however, will have some influence in setting this matter in a different point of view; and we shall now proceed to enumerate the different causes by which obstructions in the urethra may be produced.

1. Although we have said that caruncles are rarely if ever met with in the superior part of the urethra, yet as they sometimes occur towards the extremity of this canal, we cannot avoid mentioning this as one cause of these obstructions. We must again observe, however, that in every instance we have met with of caruncles, or carnosities as they are sometimes termed, they have always been of the same nature with those warty excrescences so frequently observed upon the prepuce and glans as a consequence of gonorrhœa: Most frequently, too, they have been connected with external affections of this kind.

2. Ulcers in different parts of the urethra have on some occasions been known to produce very complete obstructions.

On opening the bodies of patients who have at the time of death laboured under gonorrhœa, it has frequently been found that no ulceration could be discovered; and this gave rise to the idea that ulcers in such cases never take place. We now know indeed that very great quantities of

matter, even of a purulent kind, may be furnished by parts merely inflamed, and that are not in any degree ulcerated : But we also know, that parts remaining for any considerable length of time in such a high degree of inflammation as to furnish a great supply of pus, are very apt to become ulcerated ; and if this happens in other parts of the body, we may conclude that the same cause will be productive of the same effects in the urethra. Accordingly, there is no reason to doubt of the existence of ulcers merely as the consequence of an inflamed state of the urethra ; but it is likewise certain, that ulcers are sometimes met with in the urethra from the same cause by which sores or chancres are produced in the glans, namely, from the mechanical effects of the venereal poison, independent of the intervention of any degree of inflammation.

The excretory ducts of the different glands in the urethra, particularly of the prostate gland, as also the ducts of the *vesiculæ feminales*, and the other parts about
the

the verumontanum, have commonly been considered as being particularly obnoxious to the effects of the venereal virus; and ulcerations are accordingly said to be more frequently met with in these parts than in any other. Whatever may have occurred to others for the foundation of this opinion, I will not pretend to say; but, from all I have been able to learn of this subject from my own experience, I would say, that ulcers occur much more frequently towards the extremity of the urethra than in other parts of it, and that they are very rarely found farther back than an inch or two from the point of the yard.

3. Dissection has shown that a mere contracted state of the urethra is to be considered as a frequent cause of obstruction. In some instances, the stricture has been confined to one point, and in others the passage has been found contracted in different parts. A real contracted state of the urethra is probably more frequently produced by the cicatrices of old ulcers, than by any other cause; but as parts which have con-
tinued

tinued long in a state of inflammation, are very apt to become thickened, and even harder than they are ever found to be in a state of health, a gonorrhœa, attended with much inflammation, may frequently, it is probable, be productive of this effect.

Astringent injections are supposed by those who consider them to be pernicious, as apt to produce a contracted state of the urethra more frequently than any other cause. Injections of this kind, when improperly applied to parts already in a state of high inflammation, will no doubt often do much mischief; and, by increasing the inflammatory state of the urethra, may in this manner tend to produce strictures: But this is evidently not the fault of the remedy, but of the improper use of it. Similar objections might with equal reason be adduced against the use of every medicine with which we are acquainted; for no remedy ever proves more effectual, or more safe in its operation, than astringent injections in cases of gonorrhœa. When properly applied, indeed, many cases occur
of

of obstinate claps being safely cured by injections which cannot be removed by any other means.

4. Tumors in the cellular substance surrounding the urethra, or in any of the glands connected with it, very frequently produce most complete obstructions in the course of this canal: And inflammation, whether originally induced by a gonorrhœa or by any other cause, if it terminates in suppuration, is often attended with this effect. In such cases, indeed, as soon as the matter collected in the abscess is discharged, the obstruction produced by it is in general removed: In some instances, however, it happens otherwise; for, in different cases of this nature, I have found, that the compression produced by the tumor has induced such a firm adhesion between the sides of the urethra, as to obliterate the canal entirely. This, however, can only occur from a long continuance of the pressure produced by the tumor; and which, again, can never be continued for any considerable length of time in such a degree as completely to obstruct the passage, unless the
urine

urine has forced some other opening for itself: And accordingly, in all such cases, one or more openings, communicating with the urethra, are found between the seat of the disease and the prostate gland.

5. Of all the causes productive of obstruction to the passage of the urine, which I have ever been able to discover, none are so frequent as a particular kind of fulness or enlargement of the corpus spongiosum urethræ. On dissecting the penis of such as have laboured long under obstructions of this kind, an enlargement or thickening of the substance of the urethra, as now described, has been very often met with; and this enlargement has, in many instances, proceeded so far as totally to obstruct the passage of the urine.

In some of these this affection of the urethra was confined to a particular spot: In others it extended a considerable length; while in some it was found to have attacked different parts of the canal, leaving intermediate spaces of it perfectly sound.

We have thus enumerated the causes
which

which appear most frequently to be productive of obstructions in the urethra. We shall now proceed to the method of treatment best calculated for their removal.

When obstruction of the urethra arises from causes enumerated under the fourth head, our practice must be directed by the nature of the tumor by which the disorder is produced. Accordingly, when tumors of an indolent or schirrous nature are found to induce such obstructions, extirpation of the diseased parts, when this is found to be practicable, is the only means of relief which will probably prove useful: But although tumors of this kind which appear externally, and which do not penetrate deep, may be extirpated with safety; yet when the prostate gland, or any of the parts about the neck of the bladder, are found to be the seat of the disease, the removal of them cannot possibly be attempted. In such desperate cases, cicuta has been often used; but seldom, I believe, with much advantage. In an ulcerated
state

state of the parts, a plentiful use of uva ursi has been known to give relief; but nothing with which we are acquainted, affords such a probable chance of relief, as long-continued, tho' very gentle, courses of mercury. In the mean time a plentiful use of mucilaginous drinks is found to prove serviceable, and the violence of the pain must be obviated by adequate doses of opiates.

When, again, such tumors are evidently of an inflammatory nature, if they are not soon removed by discission, the most effectual means should be employed for promoting their suppuration.

These we have already in a former publication pointed out *. As soon as by these or similar means, the formation of matter is accomplished, the abscess in which it is collected should be immediately opened. In some other parts of the body, whenever an inflammatory tumor is probably to terminate in suppuration, it is considered as good practice to delay giving vent to the matter till pus is thoroughly formed ; but in this
situation,

* Vid. Treatise on Inflammation and its consequences.

situation, as much distress would for certain be produced by any considerable delay, the abscess ought undoubtedly to be opened as soon as there is the least reason to suppose that the pressure upon the urethra would be diminished by doing so; and this must always be the case whenever any collection of matter is evidently discovered. In every abscess, therefore, of this kind, the cure of the suppression of urine produced by it will be accomplished with more certainty by discharging the matter contained in it than by any other means. If, on laying the collection open, however, it shall be found that the stoppage in the urethra is not removed, recourse must be had immediately either to a bougie or a catheter: By introducing a bougie of a proper size and consistence, and passing it easily along the urethra, any obstruction produced by the pressure of the abscess may in general be effectually removed; and by continuing to insert either a bougie or a flexible catheter, and allowing it to remain for several hours daily, every effect which such obstructions

structions might otherwise produce, will be very certainly obviated.

In some instances, again, when abscesses of this kind are allowed to press too long upon the urethra before they are opened, the urine bursts into the cellular membrane of the perinæum and other contiguous parts, and from thence forms one or more external openings: And in this manner induces a disorder which always proves very distressing to the patient, and extremely perplexing to practitioners. This however will be afterwards more particularly considered, when we come to speak of the fistula in perinæo. In the other cases of obstructions in the urethra, proceeding from caruncles when they happen to occur; from ulcers, and the cicatrices produced by them; from stricture and contraction of the urethra; and from an enlarged and thickened state of the corpus spongiosum urethræ; when these arise from a venereal cause, the disorder of the general constitution must be particularly attended to; and we know that it can be effectually

fectually removed by a proper use of mercury only. At the same time, we must attend to the local affection of the urethra; and here a little consideration will render it evident, that the several causes of the disorder must operate in the same manner with tumors mentioned above, namely, by inducing a diminished or contracted state of the urethra: And this accordingly accounts for the universal utility of the bougie in obstructions of this passage; a remedy which, in every affection of this nature, proves chiefly serviceable by its mechanical action on the obstructed part. It has been alleged indeed by many, particularly by Mr Daran and Mr Sharpe, that, in removing caruncles and other causes of obstruction, bougies prove more useful by what they term their Suppurative quality, than by any other property: By which they mean to say, that bougies may be composed of such materials as will induce a suppuration upon the caruncles to which they are applied; and that this suppuration, if continued for a sufficient length of time,

will ultimately destroy all such diseased parts*.

This idea, although founded on inaccuracy, continues still to prevail: But a very little attention must set the matter in a more distinct point of view; and will make it appear, that the effect in general experienced from bougies, is obtained more from the mechanical pressure produced by them, than from any other property. Among other reasons which might be mentioned

* For Mr Daran's account of this matter, see his *Treatise on diseases of the Urethra*: And Mr Sharpe's account of it may be seen in his *Critical Enquiry*, chap. vi. Although Mr Sharpe is clearly of opinion, that the principal advantage derived from bougies proceeds from their influence in inducing suppuration; yet, whenever he attempts to investigate the matter with accuracy, he is obliged to acknowledge, that the pressure produced by them has no inconsiderable effect: For he says, "That though I have a great opinion of the good effects produced by the suppuration, yet I believe also, that bougies operate by distending the urethra; and I will go so far as to give it as my judgment, that even the cures done by Mr Daran are wrought partly by distention, and partly by suppuration; though he himself ascribes them to suppuration only." Vide p. 171. fourth edition, loc. cit.

tioned as a refutation of the opinion respecting the advantages to be obtained from the suppurative effects of bougies, the following seem to be sufficient for our purpose.

1. Those who allege that bougies prove commonly useful by inducing suppuration, have always affirmed that such cases of suppression of urine as are relieved by this remedy, originate most frequently from caruncles in the urethra; and that the suppuration produced by the bougies, tends to destroy, or as it were to dissolve, them. Altho' excrescences of this nature may sometimes prove the cause of obstructions in the urethra; yet, as we have already endeavoured to show, they are by no means a frequent one. From all the experience, indeed, which I have had in affections of this kind, I would say, that there does not one-tenth of the whole depend upon the existence of this cause. It must therefore follow, if this idea respecting the cause of the disorder be ill founded, that the supposed *modus operandi* of the remedies employed in it must likewise be erroneous;

for every practitioner who has attended much to this branch of business, must acknowledge, that bougies in every complaint of this nature, prove much more frequently useful than the cause upon which they have been supposed chiefly to operate is found to exist. Indeed the general utility of bougies in cases of obstructed urethra, must be acknowledged by all who have used them, while scarcely any advantage is derived from the use of any other remedy.

2. But although we should allow that caruncles are frequently formed in the urethra, we cannot admit that a suppuration induced upon them would have much influence in removing them.

We know, that, in other parts of the body, warts or other hard excrescences cannot be carried off merely by a suppuration being formed upon them; and we cannot suppose that there is much difference in this respect between the same disorder in the urethra, and in other parts of the body.

3. It

3. It has been said, that these bougies, at the same time that they act by inducing sup-puration, have likewise some influence as an application of a caustic nature ; and that many of Mr Daran's bougies, the composition of which was kept secret, were evidently possessed of this property.—Mr Daran, in order to render the operation of his remedy as mysterious as possible, did indeed allege, that his bougies were endowed with many virtues : But no candid practitioner will say, that any application of this kind, possessed of a degree of causticity sufficient to destroy warts, can with propriety be introduced into the urethra ; for, if made of such a strength as to corrode these excrescences, they would surely be in great danger of injuring the whole course of the urethra to which they are applied.—Indeed, the mildest materials we can employ frequently produce inconveniences by their stimulating power : For upon withdrawing any bougie that has remained long in the urethra, it is almost always found covered with matter or pus. It is this circumstance,

we imagine, that first suggested the idea of bougies acting by inducing suppuration; which, however, is to be considered only as a necessary effect of a stimulus applied to a delicate sensible membrane, and in no respect essential to the cure of the disorder for which the bougie was used.

4. But without having recourse to the suppurative or escharotic effects of bougies, the advantages frequently derived from them, in obstructions of the urethra, may, as we have already endeavoured to show, be easily and simply accounted for upon the principle of mechanical pressure alone.

We have thus thought it proper to consider the action of bougies with minuteness; for till once the idea is thoroughly exploded of medicated bougies, as they are termed, being necessary, much mischief may be done, by forming them of irritating or even of escharotic materials, as is sometimes the case, instead of rendering their composition perfectly mild and inoffensive, as in every instance it ought to be.

The opinion we have endeavoured to establish being admitted, namely, that
bougies

bougies ought to operate solely by mechanical pressure, it must necessarily follow, that, in the formation of bougies, much will depend on their being made of a proper consistence, neither too hard nor too soft. When too soft and compressible, they cannot act with advantage against the obstructing cause, and against which pressure is intended to be applied; and when too hard, they are apt to crack, and are neither introduced into nor retained in the urethra with so much ease as when made of a proper consistence: Bougies ought likewise to have a smooth polished surface, to facilitate their introduction; and lastly, they ought, as we have already remarked, to be composed of very mild materials, so that when introduced they may give as little irritation as possible.

Bougies may be made of a great variety of materials; but, so far as my experience enables me to judge, no composition answers the several purposes we have mentioned so well as a plaster of which simple diachylon forms the basis.—The following form I have had much experience of.

R. Emplast. Diachyl. simpl.	℥iv.
Ceræ puriss.	℥ifs.
Ol. Oliv. opt.	℥iij.

The bees wax and oil give a degree of softness to the diachylon, which prevents it from cracking, which it is otherwise apt to do upon being long kept ; besides, a better polish can be given to bougies prepared from a plaster composed partly of wax, than can be given to those made of any other materials. Burgundy pitch, rosin, and even some of the turpentine, have been advised as proper additions to these materials : But all of them tend to render the composition too irritating ; and as wax communicates a sufficient degree of tenacity to it, these ought never to be employed.

The diachylon should be slowly melted, and the wax being also melted in the oil in a different vessel, let the two be mixed properly together ; and while the liquid continues still tolerably warm, let pieces of fine firm old linen be dipt in it, care being taken, by means of a spatula, to cover the whole

whole linen as equally as possible.—If the liquid is of a proper heat, no more of the plaster will adhere to the linen than is just necessary ; but as air-bubbles are apt to occasion inequalities on the surface of the cloth, the spatula made use of ought to be somewhat warmer than the plaster, and by means of it the whole should be rendered perfectly smooth. Some indeed have desired the plaster to be spread entirely by the spatula, rather than to dip it : This, however, is attended with much more trouble, and does not cover the cloth with that equality which the formation of bougies requires.

As soon as the dipt cloth is sufficiently cold, it may be formed into bougies ; and the manner of doing it is this : The number intended to be formed ought all to be cut ; and the easiest and most exact method of doing this is by means of a sharp-pointed knife directed by a ruler. The pieces ought to be from nine to ten and eleven inches in length ; and as they should always be smaller at the point which enters the urethra

thra than at the other, this circumstance should be attended to in the cutting of it into slips. The thickness of the linen, and of the plaster with which it is spread, must in some measure determine the breadth of these slips for the different bougies: But when the linen is of a proper degree of fineness, and is rightly spread, a bougie of a middle size may be formed of a slip of about five-eighths of an inch broad at its largest end; and the point of it may be made of a proper size, and may be thus adapted to any particular case, by making the piece of linen taper more or less from about two or three inches from its smaller extremity. These slips of spread linen are now to be rolled up as neatly as possible by the fingers; and in order to give them a smooth polished surface, they should be smartly rolled between a piece of smooth hard timber and a plate of fine polished marble. This being continued till the whole are rendered perfectly smooth and firm, and their points being rounded properly in order to facilitate their introduction,

tion, they are in this state to be preserved for use.

The directions we have now given will convey an idea of the method of preparing bougies ; but no surgeon can ever become so expert in forming them, as those artists who are daily accustomed to prepare them in large quantities.

We come now to the application of the bougie.—When that kind of obstruction occurs which points out the bougie as the most proper remedy, the following is the method of using it : A bougie, adapted to the size of the passage through which it is to go, is to be well covered with fine oil, in order to facilitate its introduction ; and the penis being firmly grasped and extended with one hand, the point of the instrument is to be inserted into the urethra with the other ; and being pushed forward with caution, it is in this manner to be carried on till it meets with the cause of obstruction ; when, if a moderate force makes it pass, our object is so far accomplished :

plished : But if, after different attempts, it cannot be easily carried through, it should be immediately withdrawn ; and at next trial, which, in order to avoid any risk of inflammation, should not be made till the following day at soonest, a bougie with a smaller point should be employed.

A great deal of nicety is requisite in this part of the operation ; for, by proceeding gradually and with due caution, every risk may be avoided of injuring the urethra, at the same time that the object in view may be often accomplished with more certainty than if much force was made use of. As soon as we reach the cause of obstruction, if a bougie of the smallest size is employed, instead of pushing it on with force, as to a certain degree may be done with a catheter, it answers the purpose much more certainly to twirl it between the finger and thumb, so as to make it press very moderately upon the part which it ought to pass. But, on the other hand, although mischief has often accrued from too much violence being used in inserting bougies,
and

and although every practitioner ought therefore to be warned of the danger accruing from it; yet, when much resistance is met with, there is a necessity for pushing them on with some degree of firmness. If this, however, is done with due caution and in a proper direction, which experience alone can teach, it may frequently be accomplished without any risk, and with much advantage to the patient. In many cases, indeed, unless a tolerable degree of force be used, the bougies will not pass through the obstruction, and no benefit will therefore be derived from them; for unless a bougie be made to pass the point of obstruction, it cannot operate to any advantage.

This, I must observe, is a point of much importance, and ought to be kept in view. For although no unnecessary force should be ever employed, yet in cases of this kind we commonly meet with too much timidity; for, in ordinary practice, if the bougie meets with any unusual resistance, and if it cannot, on the first or second attempt,
be

be introduced, the case is commonly considered as desperate, and no further trials are made. I can from much experience, however, say, that scarcely any case ever occurs in which the bougie, by a frequent repetition of cautious trials, may not be introduced. Even where I have been convinced that the passage of the urethra has at a particular point been entirely obliterated by the sides of it adhering to one another, and where the urine has been voided by openings in the perinæum, the bougie, with a due degree of force properly applied, has at last effected a cure.

In some instances, bougies with very small points will enter, when others of a larger size will not penetrate; but, in general, when the obstruction is found to be unusually firm, those of a middling size are preferable to such as have very small points: For bougies of this form are very apt to bend if they do not pass forward at once; and as soon as the point yields in any degree, the bougie should be withdrawn, as it cannot afterwards be pushed forward;
for

for if more force is now employed, instead of being carried farther into the urethra, it becomes twisted, and is sure to produce a good deal of pain in the extraction *.

By different cautious trials, the bougie will at last be made to pass the different points of obstruction, for in some instances they are met with in more points than one; and as instances have occurred of bougies slipping into the urethra altogether, and even into the bladder itself, this accident ought to be carefully guarded against by a piece of narrow tape or soft thread, connected with the extremity of the bougie, and either tied round the penis behind the glans, or to a circular belt passed round the body.

Certain

* With a view to give more firmness to bougies, Mr Dease, an ingenious surgeon of Dublin, recommends their being formed upon catgut.—*Vid.* Observations on the different Methods of treating the Venereal Disease, by William Dease, Dublin.

We may likewise mention, that, for purposes of this kind, catgut alone answers exceedingly well.—When cut into the length of bougies, and on being properly polished by rubbing on a plate of marble, they become sufficiently firm for forcing almost any obstruction that can occur.

Certain regulations have been mentioned by authors for the length of time a bougie ought to be kept in the urethra: But with some patients they occasion a good deal of pain, while with others they produce little or no uneasiness; and as it is the degree of pain induced by them which ought to regulate the time they remain in the urethra, nothing decisive, it is evident, can be said upon this subject. When their introduction is attended with much pain, they ought neither to be allowed to remain long at once, nor should they be used above once in the two or three days: But when they cannot only be introduced but be retained in the urethra without producing much uneasiness, they ought to be kept almost constantly employed; for as it is by pressure almost solely that they produce any advantage, and as this pressure must be continued for a certain length of time, according to the nature of the obstruction, the more constantly the bougie can be used, the more quickly a cure will probably be accomplished.

plished. And with the same view the size of the bougie should be gradually increased, till one of such a thickness can be easily introduced as the urethra could probably receive, were we certain that no obstruction existed.

When much uneasiness is incurred by the use of bougies, the patient should never employ them but when he can confine himself either to bed, or at least to his apartment; but with many the distress produced by them is so trifling, that they can walk easily with bougies of the largest size inserted along the whole course of the urethra.

Nothing certain can be said with respect to the length of time that bougies should be used, as this must be always regulated by their effects; which, again, will in a great measure depend on the nature of the obstruction. This, however, we can with freedom propose, that the bougies ought to be continued, not only while any difficulty in passing water remains, but for a considerable time thereafter.

In the use of bougies, care should be taken never to push them altogether into the bladder : For, even when prepared of the very best materials, a portion of the composition may crack and fall off; and if this should happen to be too large to pass off with the urine, it may be a means of creating much distress, by serving as a nucleus for a stone. When it is necessary to pass any instrument of this kind so far as the bladder, a catheter ought undoubtedly to be employed ; for the risk attending the introduction of a bougie to such a length must be always considerable.

Several kinds of flexible catheters have been invented for the purpose of remaining in the urethra with ease, and for answering both the intention of a catheter and of a bougie. Various methods have been proposed for preparing these instruments ; but the most convenient form of any I have met with consists in a tube formed of flexible silver wire, wrapped spirally round a steel probe of a proper length and thickness ; and this being neatly covered with

a piece of fine linen spread with a bougie-plaster, and the probe upon which it was formed being withdrawn, the instrument is thus completed ; only it must be afterwards furnished with a silver wire or cleaner, in a similar manner with other catheters.—These instruments, however, do not prove so serviceable as was once expected ; but when it is ever necessary to allow a catheter to remain long in the urethra, one of this flexible form answers the purpose exceedingly well. It must be remembered, however, that as these catheters are covered with plaster, they ought not to be allowed to remain long in the bladder, for the same reason that we have desired bougies not to be inserted into it. When it is necessary to leave a flexible catheter in the bladder, those composed of the *resina elastica* should be employed, as the adhesive property of this substance prevents it from cracking and falling off, as every kind of plaster is apt to do.

When speaking of the formation of bougies, we have said, that as it is chiefly

by mechanical pressure they prove useful ; so a proper consistence is the principal circumstance to be kept in view in their composition. This, we must still say, ought to be the leading object in the employment of bougies : But when any tolerable certainty occurs of a chancre or internal ulceration existing in the urethra, as nothing would probably prove so useful in cicatrising the ulcer as a local application of mercury, a considerable quantity of quicksilver extinguished in honey may with advantage be added to the composition we formerly mentioned.—If two ounces of mercury, properly extinguished in this manner, be added to every six ounces of plaster in a melted state, a pretty strong mercurial preparation will thus be obtained ; and as mercury in this state produces little or no irritation, it may be employed with perfect safety.—Red precipitate in fine powder has been sometimes advised to be sprinkled upon bougies, not only to be applied in this manner to ulcers in the urethra, but with a view to corrode other causes

causes of obstruction : This, however, is a practice which we hope is now generally laid aside, as in many instances the precipitate would surely prove too violent a stimulus for the internal surface of the urethra.

Whatever may, in disorders of this kind, be the immediate cause of obstruction to the free passage of the urine, a venereal taint will for the most part be found to be the original cause of the whole : We have therefore desired, that at the same time the use of the bougies is persisted in, the patient ought to be put upon a very complete course of mercury, in order to destroy every possibility of his suffering again from the same cause ; for we need scarcely observe, that as long as any venereal infection continues to prevail, little or no permanent advantage can be expected, either from the use of bougies or any other remedy.

We have thus entered fully into the consideration of the use of bougies. Indeed, too much attention cannot be given to a

practice from which such material advantages may be derived : For by a proper use of this remedy, almost every case of obstructed urethra proceeding from any of the causes we have enumerated, may be either altogether cured, or at least greatly relieved; and was it not for the advantages derived from bougies, almost every instance of such obstructions would terminate in the most complete degree of misery.

Before concluding the subject now under consideration, we must not omit to mention the effects of bougies in some cases of troublesome gleets.—Whenever a discharge of this kind is kept up by an excoriation or slight ulceration of the urethra, as is sometimes the case, no remedy whatever proves more effectual than bougies of the mercurial kind, such as we have recommended ; and even in the ordinary kind of gleet proceeding merely from a relaxed state of the excretory ducts opening into the urethra, nothing will more certainly effect a cure than the compression induced by the common bougies.—Whether

ther they operate by affording a proper support to the relaxed membrane of the urethra, or by inducing some degree of inflammation upon the affected parts, I know not; but in many instances of those obstinate gleets which have resisted the most powerful injections, bougies have been found to prove effectual.

We have hitherto considered obstructions of the urethra in male subjects: But the same affections occur in women; and when they do so, they demand an equal share of attention. As bougies afford the easiest means of removing such obstructions, this method of cure should always be first attempted: But in women it sometimes happens, that tumors of such a size form in the urethra as cannot possibly be cured by this remedy; and as the urethra in females is not only very short, but much wider than in men, swellings of this kind may often be removed either by ligature or with the scalpel.—Nay, we know from experience, that a tumor adhering even to the bladder itself may, in women, be ta-

pen off, not only with ease, but with safety. In such cases, there is a necessity for laying the urethra open; which, at either of the sides, may be done with safety, and without any risk of wounding the vagina: And if an incision be made here with freedom, any tumor situated near to the neck of the bladder, may be so far pulled down as to admit of the application of a ligature; and whenever it can be laid hold of, this may be done without any danger.

A remarkable case is related of this kind, by Mr Warner, where a tumor of the size of a turkey's egg, produced from the internal membrane of the bladder, was extirpated by ligature, and with most complete success *. When such tumors are not so large as totally to obstruct the passage of the urine, or to be productive of much distress, a prudent practitioner would no doubt rather wish to avoid touching them: But when the reverse of this is the case, and when the urine is voided with much difficulty,

* Vid. Cases and Remarks in Surgery, by Joseph Warner.

difficulty, necessity in such circumstances points out the propriety of the operation we have recommended ; and it must be comfortable for a patient, in a situation which would otherwise be desperate indeed, to know that a remedy can be employed from which a cure may be expected.

It has been advised even by practitioners of reputation, when obstructions of the urethra proceed from caruncles or carnosities, as they are termed, to destroy them by the use of lunar caustic ; and instruments have been invented for applying the caustic with as much safety as possible to the diseased parts : But the risk of injuring the contiguous parts by applications of this nature, even when guarded in the most cautious manner, is evidently so great, as must for ever prevent the practice from being generally received.

CH A P. XV.

Of the FISTULA in PERINÆO.

BY the term *Fistula in Perinæo* is meant, a sinuous ulcer of this part, communicating most frequently with the urethra only, but in some instances directly with the body of the bladder. The term, however, is not strictly confined to ulcers of this kind in the perinæum; it is also applied to fores of a similar nature opening into the scrotum, or terminating in any part of the penis.

The word *Fistula* ought with propriety to be restricted to that species of sinus in which the edges of the sore have become hard and callous; but custom now applies it indiscriminately to every ulcer that
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is not superficial, but which lies deep, and discharges its contents by one or more narrow openings in the external teguments.

In consequence of the latitude given to the meaning of the term *Fistula*, a great variety of appearances are exhibited under this general denomination of *Fistula in Perinæo*. In some instances a single opening is met with in one part or other of the perinæum or penis, discharging matter mixed with urine; and this without any hardness or inflammation of the contiguous parts. But in others, instead of this simple form of the disease, along with one or more external openings communicating with the urethra, at which all, or at least the greatest part, of the urine is passed, the parts contiguous to these openings are very much diseased. In some instances they are found merely in a hard callous state, without much enlargement; but in others they are not only exceedingly hard, but much swelled, inflamed, and very painful. In a few cases, this hardness and enlargement
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is confined to a small space ; but most frequently, when the disorder has been of long continuance, it extends nearly from the anus to the scrotum, reducing the whole perinæum to a state of callosity. In many, too, the malady does not stop here ; but the scrotum, and even the fore-part of the penis, are liable to be affected by it ; and when the urine unfortunately escapes into the cellular substance of these parts, particularly when it lodges in any part of the scrotum, it is apt to terminate in a great deal of mischief.

As a considerable part of the urine, and sometimes the whole of it, is evacuated by fores of this nature, they are, on every occasion, productive of much distress ; and merit therefore the greatest attention from practitioners.

In treating of this disorder, the causes which give rise to it are to be first considered. They are in general as follow.

I. Wounds and other injuries of the urethra and bladder, from external violence,

lence, in whatever manner they may be produced.

In the old method of performing lithotomy by the apparatus major, the parts were so much bruised and lacerated, that the wound seldom healed kindly, and frequently terminated in fistulous sores of the perinæum; but when the operation is well performed according to the present improved method, this is seldom the case. From some cause or other, however, it happens in a few instances, that the urine does not flow freely by the yard; and as it finds a ready passage by the wound, it continues to come off in this manner, till the edges of the sore becoming callous, the disorder in question is produced. In some cases of this nature, a direct communication is kept up between the neck of the bladder and the sore; but in others, the urine passes first into the urethra, and from thence is discharged by the wound in the perinæum.

This disease is sometimes the consequence of incisions made into the urethra,
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for the purpose of extracting stones lodged in it, when the wounds do not heal, but continue open and give vent to the urine, which they sometimes do for a considerable length of time.

2. Inflammation in any part of the urethra, by whatever cause it may be induced, if it terminates in an abscess, is very apt to corrode the membrane of this canal, and to produce a sinuous opening, at which the urine is discharged along with pus. This species of the disorder, we may remark, is not an unfrequent consequence of virulent gonorrhœa: For when the inflammation spreads along the perinæum towards the anus, if it be not quickly removed by blood-letting and such other means as are employed, it will be very apt to terminate in suppuration.

Abscesses which form originally in the soft parts about the anus, are also known to give rise to it by communicating inflammation and stricture, terminating in suppuration, to the cellular substance connected with the urethra.

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3. The several causes enumerated in the last Chapter, inducing obstruction of the urethra, by impeding the free discharge of the urine, frequently give rise to the disease now under consideration: And accordingly we find that fistulous sores in the perinæum are very commonly connected with an obstructed state of the urethra.

As the disorder may be thus induced by a variety of causes, it is necessary to have these in view when we endeavour to accomplish a cure. In order, however, to render this very perplexing branch of practice as obvious and simple as possible, it is necessary to remark, that the different causes we have enumerated tend to the production of the disease by two general effects only:

1. By the formation of a passage directly into the urethra or bladder, either by external violence, or by the destruction of part of the urethra as a consequence of ulcers seated in it, or of matter collected in abscesses tending to abrade its substance; this, we suppose, may occur, independently of
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of any obstruction to the passage of the urine.

2. By the sole influence of obstructions in the urethra: These, by putting a stop to the free evacuation of the urine, at first induce a fulness and tension of the urethra, which, if it be not suddenly removed by such means as are employed, very commonly terminates in a complete rupture of this canal.

In the treatment, therefore, of this disorder, we are to be directed by one or other of these general effects; and it is to be remarked, that in no disease is it of more importance to distinguish accurately between the causes tending to induce it. When the opening into the urethra has been produced by a previous obstruction, no external application, nor any remedy directed to the system in general, will have any effect; while a proper and long continued use of bougies, by removing the obstruction, will very commonly accomplish a cure: And on the other hand, when the disorder has not originated from
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any obstruction, but has been induced by a simple opening in the urethra, bougies are not only very unnecessary, but frequently do a great deal of mischief.—This, we must observe, is a distinction which is not so much attended to in practice as it ought to be. Affections of this kind are commonly treated with bougies only, whatever may have been the cause which at first induced them: But we shall soon make it appear that this must frequently prove prejudicial.

In the cure of these disorders, too, it is a matter of the first importance to distinguish between such affections as are merely local, and those evidently connected with some general disorder of the system. For however well our means of cure might be directed towards the topical management of the sores, if the patient at the same time laboured under lues venerea, scrophula, or scurvy, no permanent cure could be expected, unless proper remedies were employed for the removal of these affections.

We shall now proceed upon the supposition, that the fores are merely local, or that any general affection with which they may have been connected, is as much as possible removed; and we shall likewise suppose, that the disorder has been originally induced by some obstruction in the urethra.—In such circumstances, if the disorder has not been of long continuance, and if the parts, through which the opening runs that communicates with the urethra, are not much diseased, the bougie is almost the only remedy that is necessary: By a proper and long continued use of bougies, in the manner we have described in the last chapter, the obstruction will in all probability be removed; at least, I have as yet met with very few instances of the contrary: And as soon as this is effected, which will be known by the instrument passing in without any impediment, and by the urine flowing in a full stream when the orifice at the sore is compressed, if this preternatural opening does not now in the course of a short time heal of itself, it will
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be found to be prevented by its edges having become hard, and by their being covered as it were with a morbid production of the surrounding cuticle.

Till this obstacle to the progress of the cure is removed, no advantage, it is evident, can be derived from any means to be employed. We are therefore to attempt the destruction of these callous edges of the fore, as soon as it is found that the bougies, after removing the obstruction in the urethra, have not proved altogether effectual; and the method of doing it is this: The patient must be laid upon a table, in nearly the same posture as is used in the operation of the stone; and a staff being introduced into the urethra, so as to pass the opening at which the urine is discharged, it is in this situation to be held firm by an assistant; while the surgeon, introducing a small probe at the external opening of the fore, and cutting upon it in the direction of the sinus, is thus to lay it open through its whole length, till it terminates either in the urethra, or, if necessary, in the bladder itself.

When more openings than one are discovered, they must all be laid open in the same manner. In some instances, there are two or three sinuses in the cellular membrane, leading from one opening in the urethra; but in others, there are as many openings in the urethra as there are sinuses or fores outwardly. This, however, is not a frequent occurrence: But it is a matter of little importance, as the same method of treatment answers equally well in both cases; for whether the different sinuses originate from one common opening in the urethra, or not, they ought all to be laid completely open from one extremity to the other.

In general, this simple division of the sinuses would prove sufficient; but when any of the parts through which they run have become uncommonly hard, a small portion of such diseased parts as lie most contiguous to the fores may be removed by the scalpel. This, it may be observed, however, is not often necessary, as the inflammation and consequent suppuration, induced

ced by the division of the parts affected, very commonly removes any slight degree of callosity ; but when the hardened parts are extensive, and appear too considerable to be removed in the course of the subsequent suppuration, such a proportion of them should be taken off by the scalpel as will not probably be removed in this manner. This, however, is a circumstance upon which nothing decisive can be said ; for the necessity of removing a portion of such diseased parts or not, and the quantity to be removed, must, in all such cases, be left to the judgment of the operator.

After all the sinuses have thus been freely divided, the staff should be withdrawn, and the divided parts gently separated by the introduction of soft lint spread with any emollient ointment, in order to prevent their immediate reunion. But although it is necessary for this purpose to insert some soft easy application between the lips of the wound, yet this ought to be done with much caution ; for stuffing or cramming the sores, as is some-

times done, always does mischief, and in some instances even renders all the other steps of the operation ineffectual. The fores are now to be covered with a pledgit of emollient ointment; and proper compresses being applied over it, the T-bandage should be employed to sustain the whole.

About twenty-four hours after the operation, an emollient poultice should be applied over the dressings; and as soon as a free suppuration is formed the whole should be removed, and light easy dressings continued till the different fores are healed by a proper adhesion of the parts at the bottom of each.

A very material part of the cure is found to consist in the dressings being duly attended to. Indeed, regular and proper dressing is of so much importance, that, without it all the previous steps of the operation will avail nothing in effecting a cure: And it is to this circumstance chiefly, we are to attribute the superior success, which occurs in cases of this kind, in private practice, over what is commonly observed

served in hospitals, where such care and attention can seldom be obtained. Even in private, there is much difference met with in the cure of fores of this nature: I have known instances of fistulous openings in the perinæum of a very bad appearance completely cured by one practitioner, when several others had failed entirely, owing in a great measure to the difference of attention with which they were treated.

I have not yet mentioned the use of the bougie, nor of the catheter, as a necessary part of the treatment subsequent to the operation: And in this I shall possibly appear to be singular; for, in all cases of this kind, we are commonly directed to keep a bougie constantly inserted from the time of the operation, excepting at the time of voiding urine, when a catheter is advised to be employed; and in order to avoid the trouble of withdrawing the one and inserting the other, some practitioners have advised a flexible catheter to be kept in the urethra from the first.

The advantages supposed to accrue from
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the use of the bougie, is the prevention of any undue contraction of the urethra ; and by the catheter it is intended to prevent the urine from passing out at the fore during the cure. These motives, for the use of both the one and the other, are plausible ; and they have accordingly been very generally adopted. I am free to confess, too, that, following the example of others, I have often, in cases of this kind, employed both the catheter and bougie ; but I cannot say that I ever did so with any advantage, and in many instances I think I have seen them do much harm. For, in every case in which they are used, they keep the urethra too much distended for admitting of an easy cure of the sores ; and if the catheter be not inserted so far as to pass fully into the bladder, part of the urine, in coming off, almost constantly passes between it and the urethra, so as to get access to the wound, and in this manner has the same influence upon the sore as if no catheter was used : And again, if a catheter is passed entirely into the bladder, and is preserved
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in this situation for any considerable time, it almost constantly does harm, by inducing pain, inflammation, and swelling about the neck of the bladder.

But whoever will attempt a contrary practice, and will endeavour to cure affections of this nature without any aid from these instruments, will soon find that they are not necessary; and that the wound in the urethra, from the operation we have described, is in general much more easily cured, without the assistance either of bougies or of the catheter, than when they are employed; for instead of forwarding the cicatrification of the sores, they uniformly tend to retard it, by frequently tearing open such adhesions, as nature, if left to herself, would have made altogether complete.

This, we must again remark, is a point of much importance, and merits the utmost attention of practitioners. The use of the bougie, in all such cases, is at present so universal, that the cure of a fistula in perinæo by an operation, is almost never attempted but where bougies are at the same
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time employed; but, from much experience in this branch, I am now perfectly satisfied, that many more cures would be accomplished if the bougie and catheter were both laid aside.

In real obstructions of the urethra, bougies, as we have said, are almost the only remedy to be depended on; but, so far as I have seen, they are of no farther use after these obstructions are removed: When, therefore, a fistulous opening remains after the removal of the obstructions, the operation we have described ought alone to be depended on; and in this part of the cure bougies ought never to be employed.

But it is said by those who patronise the use of the bougie and of the catheter, that if the urine be allowed to pass out by the fore, the cure will be thereby, if not altogether interrupted, at least much retarded. To this it may be answered, That after the operation of lithotomy, we do not find the cure retarded, although the urine comes at all times into immediate contact with, and during the first days after the operation
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passes constantly off by the wound. In what manner this is effected, I shall not at present determine ; but that the fact is so, no practitioner will deny : And from all the experience I have had in these matters, openings in any other part of the urethra require as little assistance from the catheter, as they do in that part of it which is divided by the operation of lithotomy ; and every lithotomist, I believe, would spurn at the idea of keeping a catheter constantly in the bladder after this operation, in order to prevent the urine from passing off by the wound.

After the operation of lithotomy, it happens, indeed, in a few cases, that a contraction of the urethra is produced by the cicatrix of the fore ; and in such instances, after the parts are firmly united, bougies are sometimes of use, by effecting a distention of the stricture ; and in a few cases, too, where the fore is prevented from healing by the urine continuing to pass off by the wound, in consequence of the formation of strictures or adhesions in the urethra, the bougie is employed with
advantage

advantage even during the progress of the cure. But these are rare occurrences, and no practitioner of experience ever thinks it right to have recourse to bougies, till the presence of some obstruction renders them altogether necessary; and in the same manner they ought never to be employed in the operation we have been describing, till the propriety of using them is pointed out by the formation of some degree of obstruction.

When the parts composing the perinæum have become hard and otherwise diseased, before any operation such as we have described is put in practice, we are commonly directed to a long and continued use of poultices; of mercurial frictions; and the use of resolvent gum plasters. So far, however, as I have ever seen, little or no advantage is derived from these remedies; for any suppuration expected from their use, is, in general, very partial, and has seldom much effect in removing, or even in relieving, the disorder for which it is induced.

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And, again, when the hardened parts are extensive, and when no relief is obtained from the discutient remedies we have mentioned, we are in general directed to cut them entirely away with a scalpel. There is not, however, the least necessity for such a measure; for altho' it may be proper to remove the edges of the sores when they have become callous, there is never any good cause for extirpating every part that is become hard: This would frequently be a very cruel operation; and as it could seldom be productive of any advantage, it ought rarely, if ever, to be put in practice.

When, again, a preternatural opening is found in the urethra, either by external violence or by the abrasion of its substance by abscesses seated in it, a different kind of practice becomes necessary. When an abscess in the perinæum, or in any part of the urethra, has been the cause of the disorder, much attention should be given to a free discharge of the matter; every part of the cellular substance in which it is found to lodge ought to be laid open; and
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any inflammatory tumor that has not suppurated freely should be treated with warm fomentations and poultices.—In this manner, many such affections, which if neglected would terminate in much distress, may be brought to heal ; but when even by these means the sores do not unite, but continue to discharge matter, and especially when they become fistulous, the method of treatment we have formerly pointed out must be likewise employed here.

Disorders of this kind induced by wounds of the urethra, require a similar method of cure.—By the removal of extraneous matter, and by the use of poultices to abate inflammation, a cure will frequently be effected without any other assistance ; but, when the state of the sores requires it, they ought to be laid open, and treated in every respect in the manner we have already directed.

The most distressing variety of this disorder is that in which the urine passes off directly from the body of the bladder without communicating with the urethra. This
species

species of the disease, we may remark, is readily distinguished from the other by the urine drilling off insensibly and at all times; whereas, when the external opening does not communicate directly with the bladder, and when the urine passes first through part of the urethra, the patient has commonly the power of retention in full perfection; a circumstance which renders his situation much more comfortable than when the urine is constantly passing off.—But although this variety of the disorder is easily distinguished from the other, it cannot be so readily cured; for in such cases the sinuses from whence the urine is discharged communicate directly with the bladder, and nothing has any effect in removing them but laying them open to the very bottom.

When, therefore, a patient labouring under this disorder, finds his situation to be so distressful as to render the pain and risk of such an operation an eligible alternative, it ought undoubtedly to be employed, as the only means from which any probable chance of relief is to be expected.

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As the intention and principle of this operation are the same as of that in which the urethra only is concerned, all that need be said with respect to the mode of performing it is, that a staff should be introduced into the bladder; the different sinuses should be laid freely open to the bottom; any callosities of their edges should be removed to such a depth as can be done with safety; and the wounds thus produced ought to be treated with light easy dressings, such as we have already advised.

In this manner, a great proportion of all who are afflicted with such disorders may be effectually cured, provided the means we have recommended are employed in due time, and are properly persisted in: But in long-continued fistulous sores of these parts, where the surrounding cellular membrane has become much hardened, and otherwise diseased; and especially, when the system is tainted either with scurvy, scrophula, or lues venerea; it must be acknowledged that no means with which we are acquainted will prove at all times successful.

C H A P. XVI.

Of the Hæmorrhoids or Piles.

THE term Hæmorrhoids or Piles was originally applied to every discharge of blood from the veins running upon and in the neighbourhood of the rectum; but a mere distention of these veins, when productive of pain, now receives the same denomination.

As long as the diseased parts of the veins remain distended, and do not evacuate any part of their contents, the piles

are named Cæcæ or Blind ; but when they burst or discharge blood, they are termed Apert or Open.

It frequently happens, that a discharge of blood upon going to stool is the first warning or appearance of this disorder : For although in some instances it is otherwise, yet when the parts of the veins chiefly affected lie far up the rectum, the pain or uneasiness produced by them is in general not considerable ; and this we suppose to proceed from the veins in this situation being surrounded with parts which from their softness readily yield to their distention ; whereas, when the disease occurs towards the extremity of the gut, as the intestine is here surrounded with a firm muscular covering, the sphincter ani, a good deal of resistance is thereby given to the formation of hæmorrhoidal tumors, and they are accordingly in this situation almost always productive of much distress.

When the piles are so situated as to be within view, if they have begun to discharge

charge blood, one or more small openings are observed, from whence the blood is poured out: When the parts have not been previously much distended, these openings appear to be the mouths or outlets of so many veins: And the openings from whence the blood proceeds, are each of them observed to be seated upon a small protuberance arising from the internal coat of the gut. In general, these tumors, when they discharge freely, are very small, being seldom larger than an ordinary pea; but when any obstruction occurs to the evacuation of their contents, they gradually become larger, till in some instances they arrive at the size of pigeons or even of pullets eggs, when by the pain, irritation, and tenesmus, with which in such a state they are always attended, much distress and misery are produced by them. When at last the tumors burst and discharge their contents, if they have previously arrived at any considerable magnitude, the swellings do not disappear entirely: On the contrary, they still continue of nearly

the same size; they have frequently a dark livid appearance; and instead of being soft or elastic, they have a firm fleshy consistence.

As long, however, as hæmorrhoidal tumors remain shut, they are found to be soft and yielding to the touch, insomuch that by pressure they can commonly be much diminished; their colour is still more livid than that of the apert kind, and they are generally attended with much more pain: For although they do not usually become very large before bursting; yet when they lie deep, and are thickly covered with firm unyielding parts, the tumors which occur are in some instances of such a size, as almost entirely to obstruct the passage of the fæces; and as a tenesmus is a common symptom in this state of the disorder, the distress produced by the frequent inclination to go to stool, together with the great difficulty attending the evacuation, never fail to induce a great deal of misery.

The tumors which occur in this disorder,

order, have been commonly supposed to proceed from a mere dilatation of the hæmorrhoidal veins. In the incipient state of the disease, while the swellings remain small and circumscribed, this may frequently be the case; but whenever the tumors arrive at any considerable size, they will almost constantly be found to be attended with an effusion of blood into the contiguous cellular substance.

As long as they remain small, soft, and compressible, we may always conclude, that the blood still remains within the cavities of the veins; but whenever they become large, and of a firm fleshy consistence, the blood, as we have just observed, will, in almost every instance, be found effused into the neighbouring parts.

Various ideas have prevailed respecting the nature of the hæmorrhoidal discharge: But the most prevailing opinion is, that it is almost constantly of a critical nature; that it is induced by the presence of some peccant or morbid matter in the system;

and that therefore it would, in general, be improper to put a stop to it.

It does not, however, require a minute investigation to show that this reasoning is ill-founded: For were we even to allow, that the piles commonly appear without the intervention of any evident occasional cause, and that they are in reality connected with some morbidic humour in the blood, in what manner can we suppose this diseased matter to be evacuated by the hæmorrhoidal flux? Now that the circulation of the blood is well understood, it will be difficult for the supporters of this opinion to give a satisfactory answer to this question. But independently of this, we know well, that the piles are very commonly induced, perhaps in nineteen cases out of twenty, by an evident occasional or exciting cause; and that the removal or prevention of this cause, when effected in due time, is almost constantly attended with a cure or prevention of the disorder. Almost every case of piles is, upon a proper investigation, found to have been originally produced

duced by compression upon the hæmorrhoidal veins; by which the blood contained in them being impeded in its progress towards the heart, dilatations of these veins, and subsequent effusions, are consequences which necessarily ensue.

The most frequent causes of this compression are, hardened fæces collected in the rectum, a circumstance which in constitutions liable to costiveness, is very universally met with; the pressure produced upon the neighbouring parts, in every case of pregnancy, by the gravid uterus; and lastly, tumors, of whatever nature they may be, which, from their situation, press upon the hæmorrhoidal veins.—Thus scirrhus tumors in the rectum, and similar affections of the prostate gland and bladder, are sometimes productive of this effect; and swellings of the mesenteric glands have likewise been known to compress the reflux vessels in their course from the rectum.

When tumors in the contiguous parts are found to produce the disease, the means

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of cure must be directed particularly to the removal of these. When pregnancy is the cause of the disorder, gentle laxatives, and a frequent recumbent posture will often afford relief; but nothing will affect a complete cure till delivery is accomplished. And, again, when piles have been induced by costiveness, a regular use of aperients, particularly of cream of tartar and oil of castor, will very commonly obviate every inconvenience produced by them. But when the parts inflame and become painful, such remedies must be employed as are known to be most powerful in removing, or even in preventing, the effects which these symptoms usually induce. If much fever prevails, blood should be discharged in proportion to the strength of the patient; and it should be observed, that this evacuation never proves so effectual as when obtained by means of leeches applied to the parts as contiguous as possible to the seat of the pain: The parts chiefly affected should be frequently bathed with a mild solution of *saccharum saturni*;

faturni; and the patient should be kept upon a low, cooling regimen.

We here think it proper to mention two remedies which of late we have frequently used with much advantage in various cases of piles. The one is an ointment composed of equal parts of oak-galls finely powdered, and hogs-lard or butter: This commonly gives more relief in every external hæmorrhoidal affection, than any of the sulphur ointments so frequently employed; and when the seat of the pain is internal, and cannot be reached by an ointment, injections of a strong infusion of galls are found to prove very serviceable.—The other is a remedy which I first employed on the suggestion of Dr Cullen, the balsamum copaibæ. This medicine, given to the extent of fifty, sixty, or eighty drops, morning and evening, not only relieves the pain so frequently produced by piles, but very commonly answers as an easy and certain laxative.

By the use of one or other of the remedies

dies we have mentioned, all the ordinary symptoms of piles will in general be removed: But there are some circumstances in this disorder which can only be relieved by a surgical operation; and these particularly are, such frequent returns of large evacuations of blood from the hæmorrhoidal vessels, as tend to debilitate the system too much; and the tumors which occur becoming so large as to induce much pain, irritation, and obstruction in the under part of the rectum.

The distress induced by either of these occurrences is frequently so great, as to render it necessary to employ the most effectual means for their removal; and as we have shown that the hæmorrhoidal discharge is seldom or never to be considered as critical, or in any degree as an useful evacuation, the utmost attention ought to be given to the prevention or the removal of such causes as are known to induce it.

When frequent returns of this discharge
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have evidently weakened the system too much ; and when blood-letting, the use of aperients, and a proper regimen, do not effect a cure ; necessity points out the propriety of compressing the mouths of the bleeding vessels. In slight cases of piles, this may be frequently done by introducing a tube of silver, wrapped properly round with soft linen, into the rectum, so as to press upon the parts affected : Or what applies pressure in an easier and more equal manner, a piece of sheep's gut tied at one extremity being pushed into the anus, and a quantity of water or any other fluid being conveyed into that end of it which is left open, and which ought to be of a sufficient length to admit of two or three inches hanging out at the rectum, almost any degree of compression that can be needed may thus be effected merely by pushing the water into the upper portion of the gut, and securing it there with a ligature : And by continuing the pressure for a sufficient length of time, every evacuation of this kind proceeding from small vessels

vessels in the under part of the rectum may be effectually prevented *. In some instances, however, the vessels from which the hæmorrhagy proceeds, lie so far within the rectum, that no application of this kind can reach them; and as Surgery can be of no use in these cases, those means of cure which may be directed by medical practitioners are to be employed: And again, when it so happens, that the veins which pour out the blood are so large as not to admit of effectual compression, and when they are situated towards the extremity of the rectum, they ought undoubtedly to be secured with ligatures; and these ought by all means to be applied with the tenaculum instead of the needle. With the former, the vein may be taken up almost by itself: But when the needle is used, a considerable portion of the gut must necessarily

* Mr Bromfield, when treating of the extraction of the stone in women, advises the urethra to be dilated by means of water contained in the gut of a fowl. In justice to Mr Bromfield, we must observe, that the practice here recommended is taken from this hint.

cessarily be taken up along with it ; a circumstance which must always be productive of much mischief.

We have already said, that, in some instances, the tumors produced by piles become very large. As long, however, as they are not accompanied with much pain or inconvenience, they ought not to be touched ; but whenever they acquire such a bulk as to obstruct the passage of the fæces, their removal, if practicable, becomes extremely necessary, and ought to be effected. When they are situated near to the verge of the anus, we have it commonly in our power to accomplish this with little difficulty ; and even when they are placed an inch or more up the rectum, pressure similar to that which is employed on going to stool, frequently brings them so much into view, as to admit of their being extirpated with ease and safety.

Various methods have been in use for removing tumors of this kind, namely, ligatures, excision, and even the potential and actual cauteries. Neither of the latter, however, ought to be ever employed ; so
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that the methods by ligature and excision are those we have to consider.

When a tumor of this nature is attached by a small root, and when therefore a ligature is easily applied, we are commonly directed to take it off in this manner ; and on the contrary, when such swellings are attached to the gut by broad extensive bases, they are in general desired to be dissected off with the scalpel. All we think necessary to say with respect to this point is, that when the tumors are small, and when therefore there is no reason to be afraid of any hæmorrhagy that may ensue from removing them by excision, the scalpel ought undoubtedly to be preferred to every other means, whether the swellings be attached to the gut by broad or by narrow bases : But whenever they are of any considerable size, and when there is reason to suspect that the arteries which supply them with blood are large, the ligature ought certainly to be employed, as the only safe means of removing them. No sufficient reason has ever been alleged for confining the use of the ligature to tumors with

with small necks; for although in these a ligature is more easily applied, yet, with a little attention, even such as have broad extensive attachments may be removed in this manner.

A needle armed with two firm waxed threads being introduced thro' the middle of the basis of the tumor, and the ends of one of the threads being firmly tied round one half of the swelling, whilst the other half is secured by the other thread, the whole may in this manner be removed with as much certainty as when the basis of it is narrow. If the ligatures have been properly applied, the tumor will commonly fall off in the space of three days: In some instances, they drop off in eight-and-forty hours, or even in less; but in general three days are required. When the scalpel is employed for the removal of these tumors, the parts should be afterwards dressed with soft lint, covered with any emollient ointment; but when they are taken off with ligatures, no dressing is required.

C H A P. XVII.

Of Condylomatous Excrescences, and similar Affections of the Anus.

THE parts about the anus are liable to be affected with hard excrescences, which are termed Condylomata, Fici, Cristæ, &c. The distinctions, however, which these names import are not of much consequence; for tumors of this kind are all of the same nature, and are cured by the same means.

Tumors of this nature are sometimes met with in the cavity of the gut itself; but most frequently they are confined to the parts exterior to the sphincter. They are of different degrees of hardness, being in some instances not much firmer than the parts with which they are connected; whilst

whilst in others they are found to acquire the consistence of the firmest schirrus. Their colour is also very various : In some cases they are of a pale white, and in others of different shades of red. In some instances, a single excrescence or two is only met with ; but most frequently all the parts contiguous to the anus are at last covered with them. In many cases, they are not larger than ordinary warts ; and the disease, even in its most advanced stages, is found to consist of a number of these, either adhering together, or lying quite contiguous to one another. But in others the tumors are from the beginning broad and flat, being frequently of the shape and magnitude of split garden-beans.

These excrescences, on their first formation, seem all to be productions of the cuticle merely ; but in consequence of the pressure produced by a long continuance of the disorder, they come at last to be connected with the skin itself, and in some instances even proceed to the depth of the subjacent muscles.

As long as tumors of this kind create no uneasiness, they ought not to be touched; and it frequently happens, that they do not arrive at such a bulk as to require much attention; but on other occasions, they are productive of so much distress as to render their removal absolutely necessary.

In the softer species of these excrescences, rubbing them frequently with a piece of crude sal ammoniac, or washing them with a strong solution of that salt, will frequently remove them. The pulvis sabinæ too, when finely prepared, is sometimes found to prove effectual. But both of these remedies are always slow in their operation; and when the tumors are of the hard warty kind, they have little or no effect in removing them. When they are therefore found to fail, recourse must be had either to the scalpel, or to the lunar caustic: But of the two, when the patient will submit to it, the former is greatly preferable; and we know that no danger can occur here from excision, as the parts to
be

be extirpated are never connected with vessels of any considerable size. When extirpation is resolved upon, all the diseased parts should be effectually removed; and dry lint being applied to the sores, they are afterwards to be treated in the same manner with wounds produced by any other cause.

When the fears of a patient, however, prevent him from submitting to the excision of such tumors, we are then under the necessity of having recourse to caustic: But in the use of this remedy, much attention is necessary, to prevent it from spreading to the gut; for a good deal of mischief would probably ensue from its coming into contact with the rectum.

C H A P. XVIII.

Of a Prolapsus Ani.

A PROTRUSION of any part of the intestine rectum beyond its usual limits, is termed a Prolapsus Ani. In some instances, the displaced portion of the gut is very trifling, but in others it falls down to a considerable length;

The sphincter ani and neighbouring parts, whilst in full strength, serve as a base or support to the superior part of the gut: Whatever, therefore, tends to induce any morbid debility of these, will probably have some influence in the formation of a prolapsus ani.

The most common cause, however, of this disorder is, frequent and violent exertions excited in the rectum itself by the influence of some irritating cause about its extremity,

extremity. Thus a frequent use of aloetic medicines, which commonly affect the rectum very remarkably, are often attended with this effect; and the small worms termed *Ascarides*, by lodging chiefly in the under part of the rectum, and by thus producing a violent degree of irritation, have in different instances been known to induce this disease. Habitual costiveness, hæmorrhoidal swellings, and in short every cause that stimulates the rectum to over-exertion, will, for the most part, be found to produce it.

Many instances have occurred of protrusions of the rectum remaining unreduced for a great length of time, without anything bad ensuing from it. This renders it clear, that this portion of the bowels is capable of bearing more exposure to the effects of the external air than the other parts of them are; but we ought not from this to be ever induced to allow any part of the gut to remain long protruded without making some attempt to reduce it. By writers in general, we are desired, before

reducing the gut, to foment it well with emollient and antiseptic decoctions ; and the operator is directed to cover his fingers with oiled or waxed linen before any pressure is made upon the gut. These previous steps, however, are perfectly unnecessary, and ought not to be attended to : For as soon as a surgeon is called to a patient with a portion of gut protruded, the most effectual service he can render him, is instantly to return the prolapsed parts into their natural situation, without allowing them to be longer exposed to such injuries as might probably arise from the delay occasioned by fomenting them ; and as we can handle any thing with more exactness with the fingers perfectly bare, than when they are covered with oiled or waxed gloves, these ought never to be employed ; but when any covering is found to be necessary, a piece of soft cotton-cloth answers the purpose better than any other.

The patient being put into bed, and laid upon one side, or upon his face, which answers better, with his buttocks elevated

vated above the rest of his body, the surgeon should now press firmly, though equally, with the palm of his hand upon the under part of the protruded gut. By a continuance of this kind of pressure, the gut is in general easily reduced; but when this fails, a proper application of the fingers of one hand, in order to press up the superior part of the gut while the palm of the other is still supporting the inferior part of it, will at last be sure to effect it. When, indeed, the prolapsed portion of gut has by negligence, or any other cause, become much inflamed and swelled, no attempts to reduce it will succeed till these are removed. In such circumstances therefore, before pressure is employed, it may be proper to discharge a quantity of blood in proportion to the strength of the patient, and the gut should be fomented with a weak solution of *Saccharum Saturni*, rendered moderately warm; and when, by these means, the swelling is nearly, or perhaps entirely dissipated, little or no obstruction will occur to the reduction of

the parts, by the means we have recommended.

It feldom happens, indeed, that much difficulty is experienced in the reduction of protruded portions of the rectum ; but it is frequently no easy matter to retain them after they are reduced : For the sphincter muscle, by repeated descents of the gut, often becomes so debilitated as to have little or no power in retaining it ; so that a protrusion is liable to occur, not only in going to stool, but, in many instances, on every attempt to walk, or to sit in an erect posture.

When the gut is found to fall so readily down, from the causes we have mentioned, much advantage is derived from the use of a proper bandage. After the protruded portion is replaced, if a thick compress of linen be applied directly upon the anus, a proper application of the T-bandage over the whole is on some occasions found to prove very serviceable : But in Plate XIX. there is delineated a truss originally invented for this purpose by the late Mr Gooch *, by which
such

* Vid. Cases and Practical Remarks in Surgery, &c. Vol. II, by Benjamin Gooch.

such parts may be more effectually retained than by any other bandage, while at the same time the patient is allowed to take exercise with more freedom than can possibly be enjoyed by any other means.

The parts which protrude upon going to stool being immediately replaced, an operation which a patient is frequently capable of effecting himself, this truss ought to be directly applied; and with a view to strengthen the sphincter ani and neighbouring parts, the debility of which is often to be considered as the sole cause of the disorder, the patient ought to be directed to the use of steel, bark, the cold bath, and particularly of cold applied directly to the parts affected, by throwing cold water frequently upon the buttocks and on the under part of the back: Considerable advantages have been experienced, too, from a frequent use of astringent injections, particularly of infusions of galls or of oak-bark; and when a small proportion of opium is added to the liquor, the irritability in the extremity of the rectum, which

which on many occasions we consider as the original cause of the disease, is thereby more effectually removed than by any other means. On some occasions, I have ventured to add a small quantity of alum, and in others of saccharum saturni, to these injections ; but in general, any addition of a saline nature is here totally inadmissible, from the irritation which such remedies commonly give to the gut.

By one or other of these means, every complaint of this nature may be either entirely cured, or at least so far palliated as to prevent the patient from suffering any material inconvenience from its continuance.

C H A P. XIX.

Of an Imperforated Anus.

ALTHOUGH an imperforated anus is not a frequent occurrence, yet as it is occasionally met with, and as it is of much importance to have such deficiencies soon discovered, every midwife ought to examine with attention the state of all the natural passages as soon as possible after delivery.

In some cases of this nature, the end of the rectum is found to be somewhat prominent at the usual situation of the anus, and to be only covered with skin and a small quantity of cellular membrane : But in others, no vestige of the rectum can be perceived ; and the skin retains its natural

tural appearance, without being any where elevated betwixt the scrotum and the point of the coccyx.

In some of these, the rectum has been found to terminate within an inch of the ordinary seat of the anus; in others, it has reached no farther than the top of the sacrum. In some it has been known to terminate in the bladder; and in others, in the vagina.

When the assistance of an operator is required, as death is in all probability to be the consequence if a proper vent be not obtained for the fæces, no time should be lost in deliberation. If the end of the gut is found to be covered with skin merely, and if a protuberance is formed by the fæces pushing it forward, all that a surgeon has to do, is with a scalpel or lancet to make an opening sufficient for evacuating them; but when no direction of this kind is met with, the case comes to be much more complicated, and more difficulty and danger is accordingly to be expected.

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In such cases where the gut is found to lie deep, on the child being properly secured, an incision of an inch in length should be made directly on the spot where the anus ought to be ; and this should be continued by gradual and repeated strokes of the scalpel, in the direction the rectum is usually known to take ; not in a direct course through the axis of the pelvis ; for in that direction the vagina or bladder, or perhaps both, might be brought to suffer ; but backwards along the coccyx, where there is no risk of wounding any part of importance. The best director, in every case of this kind, is the finger of the operator. The fore-finger of one hand being pushed in towards the coccyx, the surgeon, with the scalpel in the other, should dissect gradually in this direction, either till he meets with fæces, or till the scalpel has reached at least the full length of his finger ; and if, after all, the fæces are not evacuated, as death must undoubtedly ensue if something farther be not attempted, a long trocar should be pushed forward
upon

upon the finger, in such a direction as the operator thinks will most probably meet with the gut.

In this manner many lives have been saved which would otherwise have been lost. I myself have had two such cases; in both of which the gut lay deep, and in both I was fortunate enough to form an anus, which for a good many years has continued to answer the purpose sufficiently. But in each of these a great deal of difficulty was experienced in preserving the passage sufficiently wide and open: For as soon as the dossils of lint and other tents made use of for preserving the passage were withdrawn, such a contraction occurred as for a considerable time rendered the evacuation of the fæces extremely difficult. Sponge tent, gentian root, and other substances which swell by moisture, were at different times employed; but these were uniformly found to produce so much pain and irritation as rendered their continuance altogether inadmissible: Applications of this kind are frequently, indeed,

deed, recommended in such cases; but any person who has ever used them in parts so exquisitely sensible as the rectum always is, will readily acknowledge the impropriety of the advice.

Dossils of soft lint moistened in oil, and rolls of bougie plaster of a proper size, were found to irritate less than any other application; and for the purpose of dilating the passage, when, at different times during the cure, it was found to have become too strait, the method we have already had occasion to mention, of compressing blood-vessels in the rectum by introducing a sheep's gut, shut at one end, into it, and forcing water into it by the other, was also found to answer here. But upon the whole, although this part of the cure may appear to those who have not met with such cases, to be a simple and easy matter, it is found to be much otherwise in practice. Indeed, no case I was ever concerned in afforded so much trouble and perplexity as was experienced from each of those I have mentioned; for al-
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though in both, the openings were at first made sufficiently large, yet nothing but a continued attention for the space of eight or ten months prevented the necessity of a frequent repetition of the operation. When the skin alone is to be cut, it is a very simple matter indeed; for in this case nothing in general is necessary but the introduction of a dossil of soft lint for a few days into the opening made by the scalpel. But when the rectum lies very deep, I am inclined to think, from the event of these cases alluded to, that although ultimately, a complete cure may commonly be obtained after a free discharge of fæces is procured, that much nicety and attention on the part of the operator will always be required for a considerable time after the operation; and in general we may suppose, that the difficulty will be in proportion to the depth of the cut.

Even where the gut is found to terminate in the bladder or in the vagina, the operation we have recommended should be undoubtedly practised: For, in the former case,

case, as all the fæces must be emptied into the bladder, much risk must occur of such accumulations being formed as may put a total stop to the discharge by the urethra; and in the latter, where the rectum terminates in the vagina, much inconvenience and distress must be incurred; which, if the operation succeed, may possibly be prevented. There cannot indeed be any certainty of the operation in question proving altogether effectual in obviating the inconveniencies produced by the gut terminating in the bladder or vagina, as there must still be a probability of part of the fæces continuing to pass off by these outlets: But as a free passage procured in this manner, affords at least a tolerable chance of relief, no doubt ought to be entertained of putting it in practice.

When it unfortunately happens that no passage is obtained for the fæces by any of the means we have pointed out, might not we attempt an opening above the pubes, or perhaps on the right side, so as to reach the caput coli, with a view of making an

artificial anus in one or other of these places? It is true, the chance of success from such a measure would not be great; and, even allowing the attempt to succeed in the most complete manner, the discharge of fæces from such openings would always prove troublesome and uncomfortable; but the melancholy idea of leaving a child in such a situation, to die in much pain, must prove so highly distressful, both to the friends and the operator, as would at any time rather incline one to have recourse even to the doubtful and desperate remedy we have mentioned.

CHAP. XX.

Of the Fistula in Ano.

VERY sinuous ulcer in the neighbourhood of the rectum is termed a Fistula in Ano. This is the most accurate and most simple idea that can be given of the disease: For although, in different instances it assumes a variety of appearances, and although the descriptions given of these have tended to render this part of surgical pathology exceedingly perplexed; yet whoever will attentively consider the different circumstances relating to it, will find, that the fistula in ano is of a nature as determined and fixed as any disorder which falls within the limits of Surgery.

Several varieties of this ulcer are described by authors: An external opening in the neighbourhood of the anus, commu-

nicating with an internal ulcer, but without any connection with the rectum, is termed an Incomplete Fistula : When the ulcer has two outlets, one external, and the other opening into the gut, the fistula is said to be complete ; and again when the fore communicates with the gut only, without any external opening, it is termed an Internal or Occult Fistula.

This disease has been likewise distinguished into Simple and Compound. When the parts through which the sinus runs are hard and much tumefied, or when a communication is discovered between the ulcer and the bladder, vagina, os sacrum, and other contiguous parts, the fistula is said to be of a complicated or compound nature ; and, on the contrary, it is termed a Simple Fistula, when there is one or more sinuses connected merely with the internal ulcer, and when all the neighbouring parts are sound.

In the commencement of this disorder, the contiguous parts are very commonly sound ; but whenever the ulcer has been of
long

long duration, not only the parts about the anus, but even the perinæum and buttocks, frequently become diseased: An occurrence which may depend on different causes, but which seems most commonly to originate from the matter of the different abscesses or sinuses not finding a proper vent, and from its being allowed therefore to spread along the contiguous cellular substance.

Thus, we sometimes find, that the perinæum and part of the nates have acquired a schirrous degree of hardness, with various sinuses running in different parts of them; and when the matter has become sharp and acrid, instances now and then occur of the os sacrum becoming carious, and of the bladder and vagina being corroded, so as to have the contents of the rectum emptied into them. This last stage of the disease is not, however, very frequently met with; and it would probably never occur, if all such cases were properly managed from the beginning, by a free discharge being given to the matter.

In enumerating the causes of the disease, it may be remarked, that whatever tends to effect the formation of matter about the anus, may have an influence in producing it. Thus the piles, condylomatous tumors in the neighbourhood of the rectum, hardened fæces collecting in the extremity of the gut, and in short, every cause that can have any effect in exciting irritation and inflammation of these parts, will occasionally terminate in suppuration: And if the matter thus produced be not absorbed, or if the sore formed by the bursting of the abscess, does not soon heal, the disease now under consideration must occur as a necessary consequence. Inflammatory tumors in these parts also frequently occur from fevers and other disorders of the constitution.

As the circulation is more languid here than in other parts, every inflammatory swelling which occurs in this situation is not only apt to terminate in suppuration, but the sores which are thus induced heal with difficulty; on all occasions they are
productive

productive of much distress, and require great caution and attention in the treatment. Practitioners have it much in their power, however, by proper management, from the first appearance of inflammatory tumors about the anus, to prevent much of that pain and misery which such swellings, when neglected, are ultimately sure to induce.

As soon as a swelling of this kind has advanced so far as to render it probable that suppuration will ensue, we ought to employ every means to accelerate the formation of matter: And as nothing is more likely to be attended with this effect than a continued application of a proper degree of heat, warm emollient poultices, fomentations and the steams of warm water, are to be particularly depended on. By these remedies being duly persisted in, every tumor of this nature will in general be quickly brought to suppurate; and as soon as matter is formed, it ought to be evacuated by a free incision in the most depending part of the tumor.

In the treatment of this stage of the disorder, much more depends upon the boil or abscess being properly and timeously opened than is commonly imagined ; for if this be long delayed, or if the opening be not made of a size sufficient for evacuating all the collected matter, it is thus allowed to insinuate into the contiguous cellular substance, so as to separate not only the skin, but all the under part of the rectum, from the muscles and other parts with which they ought to lie in contact : And in this manner, instead of a simple sore, or perhaps one sinus running to no great depth, which, when such abscesses are rightly treated, is all we ought to meet with, the whole under-part of the gut is on some occasions entirely separated from the surrounding parts, and a variety of sinuses are found to run in different directions, either along the perinæum, or by the side of the gut, or perhaps among the muscles of the buttocks.

With a view, therefore, to prevent all the disagreeable consequences which commonly
ensue

ensue from improper management in this state of the disorder, as soon as matter is found to be fully formed, it ought, as we have said, to be immediately evacuated by a large opening in the most depending part of the tumor; by which means, and by a proper subsequent treatment, if the constitution is otherwise healthy, almost every affection of this nature may be safely and quickly cured.

After the matter collected in abscesses, has been discharged, it is not an uncommon practice to introduce dossils of lint and other substances, in order to prevent the lips of the sore, as it is said, from adhering too soon together. This, however, is a very erroneous practice: For these extraneous substances, by the irritation they give to the extremity of the rectum, almost always do mischief; and if the opening has been made of a sufficient size, there is no kind of necessity for such a precaution, as the constant stillicidium of matter from the sore, proves in general sufficient for preserving it of a size adequate to the quantity

tity to be discharged, which is the principal object we have in view in the opening of such collections.

Instead of such irritating applications, therefore, as dossils introduced into a sore always prove, as soon as the matter of the abscess has been freely evacuated, the parts should be slightly covered with soft lint spread with any mild ointment, and an emollient poultice kept constantly applied over the whole.

Any hardness which did not disappear during the suppuration, will be thus effectually removed; and when no farther obstruction occurs to the healing of the sore, a complete cure will in general be quickly obtained.

It most frequently happens, however, that the assistance of surgery is not desired in this first and very simple state of the disorder; nor till the abscess has burst of itself, and perhaps at an improper part; and till of course a great deal of mischief is found to be produced, by the matter having insinuated into the surrounding cellular substance:

stance: When one or more sinuses are discovered, forming, according to their duration, different degrees or stages of the real fistula in ano.

When, in this state of the disorder, the advice of a practitioner is desired, the first object he should have in view, is to discover with accuracy the course of the different sinuses; for nothing can be done with much certainty for the relief of the patient till this is accomplished. When the sinuses discharge their contents by external openings, there is not commonly much difficulty in discovering the direction in which they run: If they run along the perinæum, or spread among the muscles of the hips, a probe introduced in the usual manner, will readily pass along in the course which they are found to take: But when one or more of the sinuses follow the direction of the gut, the forefinger of one hand, after being well oiled, should be introduced into the rectum at the same time that the probe is entered at the wound. By this means the gut is not
only

only protected from being much injured with the probe, but if any communication occurs between the gut and the sinus, it is commonly in this manner very readily discovered by the point of the probe passing out of the sinus, and being found by the finger in the rectum. On some occasions, however, even when we are certain that the sinus communicates with the gut, a good deal of difficulty is experienced in getting the probe to pass from the one to the other; but a due perseverance at last always effects it; and if the probe is managed with caution, it may always be done without any risk of injuring the gut.

As it is of much importance in the treatment of this disorder to know with certainty, whether a sinus communicates with the gut or not, nothing should be overlooked that may enable us to determine this point with precision. When air or fæces are discharged by a sinus near the anus, or when water or any other fluid injected through the external opening of the sinus, is returned by the anus, the
existence

existence of such a communication cannot be questioned.

The absence, however, of these tests, does not imply that no communication takes place between the gut and the sinus: For we know that the passage of fæces from the rectum into such fores, does not always happen; and we may easily suppose it possible for an opening between the sinus and the gut, to be so formed as to prevent entirely the passage of any liquid from the former into the latter.

When, by a repetition of cautious trials with the probe, or with injections of warm water into the fores, the course of the different sinuses is discovered, the method of cure is next to be determined. In a former work, the method of cure adapted to the treatment of sinuses in general has been pointed out*: But from the nature and situation of the parts in which this variety of the disease is seated, some peculiarities occur with regard to the management of it.

Astringent

* Vide Treatise on the Theory and Management of Ulcers, Sect. V.

Astringent injections, pastes and ointments of the same nature, have at different times been recommended for the purpose of putting a stop to the discharge from these sinuses. But the caustic property of these remedies is by no means suited to the irritability of the parts in which the disease now under consideration always occurs; nor have they by experience been found to answer the intention for which they were proposed: They have now therefore very universally fallen into discredit.

We have elsewhere shown, that the leading object to be kept in view in the treatment of sinuses, is the destruction or annihilation of the cavities from whence the matter produced by them is discharged. For effecting this different means have been advised. Where pressure can be employed, the sides of sinuses are, in some instances, brought to adhere by a long-continued application of this remedy alone. But in many situations, particularly in the fistula in ano, this method of cure is altogether inadmissible, as such a
regular

regular and equal compression cannot here be applied as is necessary for effecting a cure.

When pressure therefore is found to be inapplicable, practitioners have recourse to the production of inflammation upon the parts which they wish to adhere to each other; for no fact is better ascertained, than that adhesion very readily occurs between contiguous parts in a state of inflammation; inasmuch, that it appears to be a doubtful point, whether animal substances can be made to adhere by any other means than through the intervention of this cause.

For the purpose of exciting this inflammatory or adhesive state of a sinus, so necessary for the reunion of its sides, different means may be employed. It may be accomplished either by the introduction of a cord of cotton or of silk along the course of the sore, or by laying the sinus open thro' its whole length, so as to convert it as nearly as possible into the state of a recent wound.

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In other parts of the body we have recommended the use of a cord, or of a seton as it is termed, in preference to every other method of cure; as by means of this remedy we have it in our power to excite almost any degree of inflammation we desire, without any of the disadvantages which now and then occur from the extensive cicatrix of a large wound. In the fistula in ano, however, the seton cannot with propriety be employed; for the irritation produced by it would prove always too severe a stimulus for the extremity of the rectum, with which it would at all times be in immediate contact.

As in this situation, therefore, astringent or escharotic injections and pastes cannot be employed with safety; as pressure cannot be applied with advantage; and as cords of even the softest materials would produce a very insupportable degree of irritation; we are under the necessity of employing the only other remedy by which a due degree of inflammation can be induced on the sides of the sinus, namely, a
free

free and extensive incision along the whole course of the fore, commencing at one extremity of the sinus and terminating at the other.

Having thus ascertained the proper method of cure, we shall now proceed to describe the easiest and most effectual manner of putting it in practice.

The course of the different sinuses having been discovered by a previous search in the manner we have directed, as it is of importance to have the bowels, and particularly the rectum, emptied, a laxative should be administered on the day preceding the operation, and a glyster an hour or two before proceeding to it.

There are two postures, either of which the patient may be placed in with nearly equal advantage. He may be either allowed to stand upon his feet, with his back exposed to the light of a window, and with his head and upper part of the body bent forward, and leaning upon a chair, a table, or on a bed, a posture which exposes the parts affected sufficiently well;

or he may be laid upon a table in the same manner as is done for the operation of lithotomy, with his legs bent and kept asunder by an assistant; but this being more formidable, and not answering the purpose much better, the other is commonly preferred.

The patient being firmly preserved in one or other of these positions, the surgeon, after dipping the fore-finger of his left hand in oil, must introduce it as far as it will reach into the rectum; and with his right hand, he must now enter the point of the probe-pointed bistoury, at the external opening of the sinus; and having carried it along the course of the fore till he feels the point of it, through the opening in the gut, upon his finger in the anus, (for we are supposing this to be a case attended with a communication between the sinus and the rectum,) he is now to push the point of it out upon his finger; by means of which, he not only protects the opposite side of the intestine very effectually, but, by thus directing the point
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of the instrument, he cuts with great steadiness, and the sinus is in this manner laid open with much ease from one extremity to the other. This being done, if there are any other external openings, the finger should be again introduced into the rectum, and every fore that is met with should be laid open in the manner we have now directed. The bistoury here recommended is delineated in Vol. I. Plate VII.

It has been alleged, that every external opening met with in this disease communicates with a separate and distinct fore; and some have gone so far as to say, that these again are commonly found to communicate by separate openings with the gut. This, however, is seldom, if ever, the case; for it almost constantly happens, that all the external sinuses communicate with one common fore or abscess, and that this again has no communication with the rectum, but by a single aperture. In some instances, indeed, more than one opening is discovered between the gut and the cavity of the fore: But this is a rare occur-

rence ; and at any rate, the means to be employed are in both cases nearly the same: —That is, whether the external or internal openings communicate with one or with more abscesses, they are all to be laid open from one extremity to the other.

In almost every instance, however, it is, as we have already remarked : When the principal sinus is laid open through its whole course, from the entrance of the knife, to the aperture in the rectum, the others are found to run no farther than into some part of the fore, without communicating directly with the gut ; so that their entire division is quickly and with much ease accomplished.

We have desired, in searching for the course of the different sinuses, that this part of the operation may be done with much exactness ; so that it may be known with certainty, whether a communication actually occurs between the gut and the fores or not. The most material motive for this is, that, in making the incision, the knife may enter from the sinus into the
gut

gut at this very opening; which is not only proper from such openings being commonly found to lie at the most superior point of the sinus, but from its being necessary in making the cut to direct the knife, so that the aperture into the gut may form a part of the incision: For, if the passage between the gut and the sinus should not be divided, little or no advantage would probably be derived from the operation; for as the parts would not readily adhere at this point, the fæces getting access to the cellular substance behind the gut would be apt to give rise to a new collection of matter.

It frequently happens, however, as we have already remarked, that no direct communication can be discovered between the rectum and any of the sinuses which occur here; in which case the fistula is said to be incomplete: But, in the method of cure, the treatment is nearly the same as when such a communication takes place; only with this difference, that in the latter, the point of the bistoury passes into the

gut at the aperture found in it ; whereas in the former, an opening similar to this must be made in it at the superior part of the sinus, by pushing the point of the bistoury against the finger into the rectum with such a force as is found to be necessary for penetrating the gut ; and this being done, the operation is to be finished in the manner we have already directed, by drawing the point of the instrument out at the anus, so as to divide the sinus through its whole length.

In the course of this operation the sphincter ani will be always divided, when the fistula penetrates to any considerable height in the rectum : But this is not a matter of much importance ; for although some degree of inability to retain the fæces frequently ensues for a few days after the operation, yet experience shows that the parts in general recover their tone very completely, insomuch that want of retention is scarcely ever mentioned as any of the inconveniences to which patients are exposed

exposed who have been cut in the manner we have recommended.

A variety of instruments have been proposed for effecting this operation; but none of these answer the purpose with so much ease and safety as the probe-pointed bistoury. A razor with a probe-point may be used in nearly the same manner; but as the bistoury is possessed of all the advantages attending the razor, and as it can be directed with more steadiness, it ought therefore to be preferred.

It has been objected to this mode of performing the operation, that, in the case of an incomplete fistula, the point of the bistoury, on being pushed through the gut, will be apt to hurt the finger in the rectum; and likewise, that this method can never take place where the sinus runs farther up the rectum than the finger is capable of reaching: And with a view to obviate these inconveniences, different instruments have been proposed, particularly a director and scalpel.

The director, which ought to be very

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large,

large, being introduced into the rectum, the sinus or fistula is advised to be laid open through its whole length, by a scalpel being made to cut directly upon this instrument, after being entered at the external opening of the fore, and gradually passed as high as the sinus is found to reach. This, we must observe, however, is a practice that ought not to be imitated: For the hazard with which it must be attended is evidently so great as to give cause to suspect that it has seldom been attempted, and that it has been recommended merely by such writers as have copied from one another, while few have ever employed it. The parts chiefly affected by the operation, lie so contiguous to organs which it would prove extremely dangerous to injure, particularly to the bladder, that we ought never on any account to attempt to lay sinuses in this situation, open, unless the finger is previously introduced to serve as a director for the bistoury; and for the same reason the instrument ought never to be carried farther than the finger can easily reach. Fistulous
fores

fores do not commonly penetrate deeper here than the length of the fore-finger: In some cases, however, it is otherwise: And they are found to pass to the very superior part of the os sacrum, or perhaps across the pelvis in a direction between the rectum and the bladder. In every such instance, however, all that can or ought to be done by an operator, is to lay the under part of the sore completely open, so as to procure as free and easy a discharge to the matter as possible; for any advantage to be derived from carrying the incision to a greater depth than the finger can reach, would seldom if ever compensate the hazard of the attempt: And in every case of this nature, where the sinuses are confined to the under part of the gut, no necessity whatever occurs for the assistance of a director; for whoever has attempted this operation in the manner we have advised, will find that the rectum is penetrated by the probe-pointed bistoury with much ease, and that this may be done without any hazard of injuring

juring the finger previously introduced into the gut.

It is alleged by some operators, that danger may occur from laying sinuses in this situation freely open with the scalpel : Troublesome hæmorrhagies, they think, may happen, from cutting the hæmorrhoidal arteries and veins ; and in order to prevent them, it has been proposed to open the sinuses by means of ligatures : By introducing one end of a piece of pliable silver or lead along the course of a sinus, pushing it into the rectum, and drawing it out at the anus, so as to twist the two ends of it together, the contained parts are thus directed to be gradually compressed so as to produce an entire and safe division of them. But this is a much more painful, as well as a more tedious, method than that by the scalpel, and it is not in any respect necessary ; for every practitioner of experience must acknowledge, that the risk in this operation of suffering from hæmorrhagy is very trifling indeed, even after the scalpel has been used with much freedom.

It

It is not probable, therefore, that the practice we have mentioned will ever be generally employed.

The different sinuses which are met with having all been laid open with the scalpel, care must be taken to apply the necessary dressings; and upon this much of the success to be derived from the operation certainly depends. Some operators are so inattentive to this point, as to suppose every thing is done that is necessary, when the parts are merely divided; but this is so far from being the case, that we may venture to assert, no cure can ever be reasonably expected, if much attention be not given to the subsequent dressings of the fores.

The fores ought by no means, however, to be much crammed with any kind of dressings; and nothing should be employed that is not perfectly mild, and incapable of producing irritation. Dry lint is almost the only application which practitioners use, but it is ill suited for the purpose for which it is intended. One of the most troublesome and perplexing symptoms

toms subsequent to this operation, is a diarrhoea, attended with a tenesmus, or a frequent desire to go to stool. In some instances, the division of the sinuses alone may produce this effect; but it very commonly happens, that any mischief of this nature may be traced as a consequence of the after-management of the fores: For every application that is not of the very mildest nature, and especially when pushed with any degree of violence into the bottom of the wound, is sure to induce a very disagreeable and almost constant irritation in the extremity of the gut; and as this irritation is almost always attended with a frequent discharge of fæces, which proves not only debilitating to the system in general, but has a considerable influence in interrupting the cure of the fores, it becomes highly necessary to avoid it.

For this purpose, instead of dry lint, I have long been in the practice of using either lint or soft old linen spread with any simple mild ointment; which effectually

tually prevents that distressful irritating sensation which dry applications to such sores, are so very apt to induce. After the sores, therefore, have been cleared of any coagulated blood, a piece of soft lint, thinly covered with a simple liniment of wax and oil, should be gently insinuated between their edges ; but not to such a depth, or with such force, as to create any kind of uneasiness. This being done, and a compress of soft linen with a T-bandage being applied over the whole, the patient should be carried to bed ; and the dressings being renewed, either after every stool, or, when these are not frequent, once in the twenty-four hours, the sores will in general fill up from the bottom, and will at last cicatrise in the same manner as wounds in any other part. Such sores, indeed, ought to be treated in every respect as similar affections in other parts of the body : For although, by writers in general something mysterious or peculiar is supposed to exist in sores about the anus ; yet the fact is undoubted, that this is by no means
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the case : They are of a nature exactly similar to fores in other parts, and are to be cured at all times by the very same means. They ought to be lightly and easily dressed, in the manner we have directed. As soon as a suppuration takes place, or if in the mean time the dressings are disturbed by the passage of fæces, they ought to be renewed ; taking care to remove, with as little force as possible, any fæces that may happen to lodge within the lips of the wounds ; but by no means to use, with such freedom as has been recommended, injections of detergent liquors, for the purpose, as is said, of cleansing the fores. Every application of this nature, so far as I have ever seen, does much harm. It irritates the parts to which it is applied ; and this is commonly succeeded by some degree of inflammation. All remedies of this kind, therefore, should be carefully avoided.

We have already said, that, by persevering in the mild course of treatment here pointed out, a cure in general will at last be

be obtained. But in some instances it is otherwise; and instead of a good suppuration, with red fresh granulations, with which the wound in a healing state ought to be covered, the sore acquires a soft, flabby, unhealthy appearance, and the matter discharged from it is thin, fetid, and perhaps mixed with blood. In such circumstances, if, on a minute examination of the sore, any part of a sinus is found to have been overlooked, and matter is found to lodge in it, a certain and almost immediate advantage may be expected from laying this freely open to the bottom. But it commonly happens, that such untoward appearances as those we have described, proceed from some morbid affection of the general system; and till this is perfectly eradicated, it will be vain to expect a cure of the sores. When, indeed, any general indisposition is previously suspected, it would be better to attempt the cure of it before performing any operation; but this we have not always in our power, as the first indication of any such affection is
very

very commonly received from the appearance assumed by the sores several days after the sinuses have been laid open.

As soon as it is with certainty known, however, that any disorder exists, by which the cure will in all probability be retarded, all our endeavours should be employed for removing it. If the patient is found to labour under lues venerea, scurvy, or scrophula, the remedies adapted to these should be immediately prescribed; or if the constitution has suffered merely from debility, as the consequence either of a preceding fever, or of a plentiful discharge of purulent matter from the sores, the natural tone of the system should be restored, by a nourishing diet, together with a proper use of some generous wine.

In a former publication upon Ulcers, we have endeavoured to inculcate the utility of issues in every species of sores; but in no variety of the disorder does this remedy act with more evident advantage than in the fistula in ano, especially when the discharge of matter has been of long duration. Different

ferent instances, indeed, have in the course of practice occurred to me in which, without the assistance of issues, no advantage of importance could be obtained; and upon the whole, I am now so much convinced of their utility, that whenever the disease has been of long duration, I never advise the operation till a drain of this nature has been previously opened.—In every case, therefore, of this kind, at the same time that any disorder under which the constitution may labour is attended to, an issue, somewhat proportioned to the quantity of matter discharged by the sores, should be immediately employed. By this means, if the operation has been properly performed, and if the disorder has not previously affected any of the contiguous bones, there will be, in general, much reason to expect that a complete cure will be obtained.

We have hitherto been supposing, that the disease has not as yet advanced farther than to produce sinuses along the course of the rectum, and in its neighbourhood:

We shall now proceed to consider it in its more advanced stages.

The first of these we shall take notice of, is that in which the parts lying contiguous to the fores have been separated, or detached from one another, by a mere effusion of matter into the cellular substance, by which in a state of health they are naturally connected together. This, to a certain degree, is the case in every sinus; but when the disorder now under consideration has been of long duration, the matter produced by the fores, if it does not find a very free outlet, is in some instances known to spread so surprisngly among the contiguous parts, as to separate, not only all the skin and other teguments from the muscles underneath, but to detach all the under part of the rectum from the cellular substance with which in a state of health it is firmly connected.

This, it must be remarked, is not a common occurrence; but in some instances it is met with, and some variety has been proposed in the treatment best suited

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to its removal. Two modes of operating have been recommended in this state of the disorder; either to take away a considerable portion of the external teguments, so as to give free vent to any matter that is collected; or, if this does not prove sufficient, to extirpate all the inferior part of the rectum that is found to be detached from the surrounding cellular substance and muscles.

These operations, however, are both productive of a great deal of temporary pain, and of much subsequent distress; and as all the advantages attending them may be attained from a much more simple method of cure, they ought undoubtedly to be laid aside.—To take away any considerable portion of the teguments about the anus, must always be considered as formidable: But to extirpate the extremity of the rectum, must in all probability be the cause of more pain and misery than could ever be induced by the disorder intended to be removed by it; for, besides the difficulty and pain that

would be constantly experienced in the passing of hard fæces, it would be almost impossible for a patient in such circumstances to retain stools of a more liquid kind.

There is fortunately, however, no good cause why any person should be ever forced into such a disagreeable situation; for a simple division of the gut, in one, or at most in two different parts, will always accomplish a cure with more certainty than any other means with which we are acquainted. In such circumstances, therefore, all that ought to be done is, to lay the detached portion of gut open from one extremity to the other in the manner we have already directed in cases of more simple affections; and if this is not found to be fully sufficient for allowing the gut to apply with perfect equality to the contiguous parts, another incision should likewise be made on the opposite side of the rectum; by which means all that portion of it which was separated from the surrounding muscles will now be equally applied

applied to them ; no portion of it will be in any degree puckered or improperly elevated ; and if the neighbouring bones and other parts are sound, and if the constitution be not otherwise diseased, a complete cure will in all probability be obtained by an adhesion again taking place between the gut and parts lying behind it.

Upon similar principles too, when the matter, instead of having separated the gut from the surrounding parts, is found to have insinuated, either between the skin and muscles of the perinæum, or of the hips, which in some instances it does, the sacculus or bag produced by it should be freely laid open from one extremity to the other ; and if one incision is not found sufficient, another should be made immediately ; care being taken to follow out the direction of the abscess or collection of matter in such a manner as will most readily bring the parts which have been separated into close contact with those lying underneath.

We have already recommended light easy dressings in the operation proposed for the first stages of the disorder; and we may here remark, that they are equally proper after the operation we have now been pointing out: Nothing should be inserted between the teguments and the subjacent parts; all that is necessary being to cover the sores with pledgits of soft lint spread with any emollient ointment.

Hitherto we have been supposing that the fistula or sinus discharges its contents by one or more external openings in the neighbourhood of the anus: In some instances, however, this mark of distinction is not met with; and the matter, instead of being evacuated in the usual manner, is first emptied into the gut, and afterwards discharged either by itself, or mixed with fæces on the patient's going to stool. This, as we have said, forms what has been termed an Occult Fistula, or, according to French authors, *une Fistule Borgne*.

As the most certain characteristic of this disorder, namely, an external opening discharging matter, is totally wanting in this variety of it, some attention is commonly requisite, in order to ascertain its existence, as well as to prevent other diseases from being confounded with it.—Thus, matter discharged from abscesses in the superior part of the bowels, has, in some instances, been supposed to proceed from an occult fistula in the neighbourhood of the anus; and vice versa, pus collected in and discharged from an imposthume near to the anus, has, merely from want of attention, been supposed to originate from some affection of the upper parts of the guts; and upon this supposition, remedies have been prescribed without any effect, when a complete cure might have been obtained by very simple means.

The distinction, however, between these affections, in general is sufficiently evident. When matter collected in the superior part of the alimentary canal, is at last discharged by stool, it is commonly tho-

roughly mixed with, and seems to constitute a part of, the fæces, and no pain or swelling is observed in the parts contiguous to the anus. But, in the case of an occult fistula, the matter discharged by stool is not mixed with the fæces; on the contrary, when examined, they are found to be distinct and separate; and, on a minute investigation, some degree of hardness, swelling, or discoloration is always discovered in the vicinity of the fundament; and on this spot, a considerable degree of pain is uniformly complained of, on much pressure being applied to it. By attending to these means of distinction, little or no difficulty upon this point can ever occur.

In cases of occult fistula, a variety of means have been proposed for discovering the abscess in which the matter is collected. By some it is said that a curved probe may be passed up the anus; and by searching with the point of it, that the opening into the rectum may in this manner be discovered, and, by pushing it forward, that
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it must for certain pass into the abscess*: And others, again, advise a thick firm tent to be pushed into the rectum, so as to obstruct every means of communication between the sinus and gut; and by this means, they suppose, that the matter of the abscess may be made to collect in such quantities as evidently to point out its situation. Neither of these methods, however, is in any degree necessary, nor is it probable that they would often succeed.

Whenever an abscess is seated near to the verge of the anus, a very little attention will discover the part chiefly affected: For, even although the matter be not allowed to collect, from the frequent pressure on going to stool forcing it always out by the orifice in the gut, yet still some degree of hardness, a small tumefaction, and most frequently some discoloration, is observed at some part contiguous to the extremity of the rectum; and whenever this mark is discovered, and especially if the patient complains of pain on pressure, no doubt
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* *Vide* Dionis—Course of Operations, Demonstr. IV.

can occur of this being the seat of the abscess.

In such circumstances, what are we to do? We ought here to have the same object in view, as if the matter had been discharged by an external opening: For the disease is in reality the same, and differs only in this single circumstance from the most frequent species of fistula, that the matter is in this case first thrown into the rectum, before it can be evacuated, instead of coming freely off by one or more external outlets near to the anus. And as the two varieties of the disease are very nearly the same, so the means necessary for their removal are very similar.

As soon as the operation is determined upon, the point of a lancet or of a scalpel, should be plunged into that spot, where, from there being some degree of tumefaction, discoloration, or pain, we have reason to suspect that matter is lodged; and upon the point of the instrument reaching the abscess, which will be always known by a partial discharge of pus taking place,

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as the disease is now reduced to the state of a simple, complete fistula, the operation is to be finished in the same manner as we have directed for that variety of the disorder, by the introduction of the finger of the left hand into the anus, passing the probe-pointed bistoury in at the wound newly made, and, on its point being discovered by the finger in the rectum, drawing it out in such a manner as to divide the abscess or sinus through its whole length. —The subsequent treatment of the sore ought to be the same here as in other cases of fistula.

All that has been as yet said relates to the mildest and most simple stages of the disorder, whilst the parts chiefly affected are supposed to be in no other respect diseased, than by having an abscess seated in them, either occult, or with one or more external sinuses running into it. —But when by neglect, or improper treatment, the matter collected in such abscesses does not find a free vent, the parts most contiguous to it inflame, become
painful,

painful, and in a gradual manner acquire such a morbid hardness or callosity, as is productive of much inconvenience and distress.

In such circumstances, various remedies have been recommended.—It has been proposed, as a previous step to any operation, to dissolve this hardness of the parts affected, by means of mercury exhibited internally; by the application of mercurial and other plasters of a discutient nature; and lastly, by suppurative or emollient poultices.—Caustic preparations, with a view to corrode or destroy the hardened parts, have also been recommended; but the opinion that has till of late most generally prevailed, is, that in all such cases, the parts that have become very firm and hard ought to be altogether extirpated with the scalpel.

But whoever has had opportunities of becoming acquainted with this part of practice, will know, that it is perfectly impracticable to dissolve or dissipate any callosity that has been of long duration,
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either by poultices, by mercurials, or any other discutients; and it very fortunately happens, that a cure of the disorder may in general be obtained with tolerable certainty, by means of a more gentle nature than the destruction of the parts affected, whether by caustic or extirpation: When the parts cannot be preserved but at the hazard of the patient's life, they ought undoubtedly to be removed; but as necessity only ought to point out the propriety of such a violent remedy, it should never be employed when our views can be accomplished in a milder manner.

We have endeavoured to show, and indeed the fact is self-evident to all who will be at the trouble of observing, that the hardness of parts which occurs towards the latter stage of this disorder, proceeds uniformly from the matter of the abscesses or sores not finding a free vent, and from its being thereby forced to disperse among the contiguous muscles, by which pain, inflammation, and hardness, are successively and necessarily produced.

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If this is a true state of the matter, and we believe all who pay due attention to the subject will find it to be so, there can be no necessity for the use of such violent remedies as those we have mentioned, namely, the removal of the diseased parts either with caustic or the scalpel: The means of relief which naturally occur here, are merely such as will afford a free outlet to the collected matter, at the same time that they tend to prevent every such collection in future, whilst they also serve to induce and preserve a suppuration in the substance of the parts chiefly affected, and which we are inclined to consider as the most effectual method hitherto discovered for the removal of all such morbid callosities.

Through the whole of this chapter, I have avoided the use of the word Schirrus; and I am here particularly anxious to have it remarked, that I have done so: For in a real schirrus, the remedy now recommended, namely, the excitement of suppuration in the substance of the diseased

eased parts, would in all probability prove very pernicious, by forcing quickly forward to a real cancerous state, a tumor, which, if left to itself, might possibly have remained indolent for a considerable length of time. But both here and elsewhere, when treating of such affections, we would wish to excite the attention of practitioners to an accurate diagnosis of the subject; for negligence or ignorance on this point, is sure to be succeeded by perplexity and maltreatment in the method of cure. Every hard tumor of the soft parts which from experience is known to be apt to degenerate into cancer, I would denominate Schirrus; and I am clear that the term ought to be confined solely to this species of tumor. Now we know well, that cancers very rarely attack tumors that are not glandular: So that to every indurated swelling of the cellular substance and other soft parts not evidently glandular, a different appellation may with great propriety be given; and to all these, the term Callus, I think, is very properly applied.

Such

—Such hard tumefactions, therefore, as occur in cases of this nature in the vicinity of the anus, as they are in general seated entirely in the cellular substance, and as they probably never, while they are confined to this substance, degenerate into cancer, I have termed Callosities; and, so far as my experience goes, nothing tends so effectually to dissipate such indurations, as to induce a free and plentiful suppuration in their substance.—It fortunately happens, too, that the very remedy which with most certainty answers this important indication, proves in the disorder we are now considering perfectly sufficient for every other purpose.—The means alluded to, are incisions along the course of every sinus that can be discovered; and, when these are not numerous, in proportion to the extent of callosity which occurs, it even proves serviceable to make one, two, or more deep incisions along the whole extent of the induration. For, as we have already remarked, nothing tends so effectually to dissipate swellings of
this.

this nature, as a free suppuration being kept up in their substance; and no means whatever promotes this with so much certainty, as the incisions we have here recommended. By carrying them to the full depth of the indurations, such a plentiful suppuration ensues to the inflammation which first occurs, as has commonly a very powerful influence in removing them.

Indeed no person can well conceive the great utility which frequently results from this practice but such as have experienced the advantages to be derived from it: In different instances, I have known complete cures effected by it, where extirpation of the diseased parts had been previously considered as absolutely necessary. In long-continued affections, however, of this nature, and where the parts have become very considerably thickened, the remedy must be persisted in for a great length of time; that is, a plentiful discharge of pus must be long preserved, either in the incisions first made, or, if these heal too quick-

ly, in others that have been made to succeed them.

In some instances, these incisions are not easily induced to suppurate; their edges inflame, become painful, and discharge a thin fetid matter. When this is found to proceed from a venereal affection, or any other diseased state of the constitution, this general disorder, of whatever nature it may be, must be first removed, before any beneficial alteration can be induced on the incisions. But when the system is otherwise healthy, and when there is therefore reason to imagine that the untoward state of the sores proceeds merely from irritation or some other local affection, in such circumstances the greatest advantages may be derived from the use of warm poultices: By their emollient properties, they tend to remove irritation more effectually than any other remedy; and we have elsewhere shown, that they operate with more effect than any other means in promoting a laudable suppuration.

In

In every case of fistula, therefore, attended with much hardness and tumefaction of the contiguous parts, instead of removing such parts as are diseased either with caustic or the scalpel, the practice we would advise is this:—The sinus or fistula should be treated in the very same manner as if no hardness existed; that is, it should be laid freely open from one extremity to the other: If more sinuses are discovered, these should also be laid open; and if the hardness in the contiguous parts extends either laterally or in any other direction far beyond the course of the sinuses, one or more deep incisions should be made along the whole length of it: And by preserving a suppuration in these incisions till the hardness is mostly dissolved, they may then be allowed to heal from the bottom in the same manner with wounds or ulcers induced by any other cause.

By this management alone, when the constitution is otherwise healthy, the very worst species of fistula may be brought to

heal much more readily, and with much more comfort to the patient, than by the extirpation of the hardened parts. Indeed scarcely any case, we think, can occur, of this disorder being in such a state as to require the removal of such parts, unless when it accidentally happens, that, together with much tumefaction and callosity, the parts which are diseased have been long and almost entirely separated from the subjacent muscles, with which, in a healthy state, they ought to be connected. This, however, is an occurrence which never happens but from very gross mismanagement: But when it is met with, and when the hardened parts are so much detached from the others, as to render it probable they would not again be easily brought to adhere, necessity, in such circumstances, points out the propriety of extirpating them; and in cases of external ulceration in these parts, when the edges of the fores have become hard and reversed, the cure may be promoted by removing such portions of them as are more particularly diseased; but in no other instance.

stance ought this practice to be attempted ; for all the advantages said to be derived from it, may be obtained with much more ease and safety from the means of cure we have here pointed out.

The only other symptoms connected with this disorder, which we have not yet adverted to, are such as proceed from affections of deep-seated parts ; namely, such as originate from diseases of the os coccyx, of the sacrum, of the bladder, &c.

It sometimes happens, indeed, that the matter collected in fistulous sores about the anus, by being allowed to spread among the neighbouring parts, comes at last even to affect the bones themselves ; but instances likewise occur of such affections of the bones being the primary disorder, and of their giving rise to, instead of being produced by, the sinuses about the rectum. Thus, collections of matter on the psoæ muscles, originating, in some instances, from a caries of the lumbar vertebræ, instead of falling down and pointing, as they most frequently do, in the

upper and fore part of the thigh, are now and then found to follow the course of the intestines, and to discharge their contents in the vicinity of the anus. A severe bruise upon the hips, too, by inducing a fracture and a subsequent caries of the os coccyx, has, in some instances, produced the same effect.

But the most distressing circumstance ever known to accompany this disorder, is the formation of a passage between the rectum and bladder. This, indeed, occurs in some instances independently of any previous sinus or abscess about the anus; but it is more frequently induced by ulcerations in these parts, and by these being improperly treated, than by any other cause. The symptoms by which the existence of this dreadful occurrence is most certainly known, are, in the first place, an unusual dark brown thick sediment being observed in the urine, which by degrees becomes of a darker colour, and of a more offensive fæcal smell; and in the latter stages of the disorder, it very commonly happens

happens that obstructions occur to the passage of the urine, and air is frequently discharged in considerable quantities by the urethra both before and after voiding urine.

By the presence of these symptoms, the nature of the disorder is rendered sufficiently evident; but hitherto we have not been so fortunate as to discover any means of removing it. So that whoever have yet been attacked with it have always fallen victims to its influence, after dragging on twelve or eighteen months, or perhaps two years, when the constitution has been good, of a very miserable existence.

In the event of any of the bones of the coccyx, of the sacrum, or lumbar vertebræ becoming carious, from the matter in this disease having been allowed to penetrate and to corrode them, all that art can do is to preserve a free vent to any matter that may happen to form; to keep the parts clean; to extract any pieces of loose bone that may be discovered; and to

strengthen the constitution by a proper nourishing regimen, with a view to enable it to support the long-continued discharge to which in all probability it will be liable. Some few have in such circumstances, and with such a plan of management, been fortunate enough to obtain cures, by such pieces of bone as were spoiled being at last thrown off, and by the parts being then induced to heal. This, however, it must be confessed, is a very uncommon occurrence; and all that, in this situation, is in general to be expected, is a mere palliation of such symptoms as prove most distressing.

We have thus concluded what was proposed to be said upon the fistula in ano; and as it is a very distressing as well as a very frequent disorder, and especially as it is one of those subjects which till of late has never been distinctly or accurately treated of*, I have for these reasons entered

* Mr Pott, in his excellent Essay upon this disease, was the first who treated it with any degree of accuracy.

tered more minutely into the consideration of it than might otherwise have been necessary. What I have all along endeavoured to show, and what I still wish to excite the attention of the younger part of the profession to, is, that a sinus or fistula is a disease of the very same nature when seated in the neighbourhood of the anus, as in any other part of the body ; and therefore that the method of cure ought to proceed upon the same principles here as in similar affections of other parts. Till the late improvements made in the treatment of this disorder, and till the true nature of it was understood, much confusion subsisted in the ideas entertained of it. Except in the most trifling cases of superficial sinuses, it was never imagined that a simple incision could accomplish a cure: Nothing less than a total destruction or removal of the diseased parts was supposed to be sufficient for this purpose.

But it will now, we hope, appear evident, that this is very rarely necessary ; and when a cure is practicable, that it will
be

be more readily effected by the means we have recommended, namely, by a mere division of the sinuses, than by any other as yet proposed. It will sometimes happen, indeed, that, in cases of a very inveterate nature, no means with which we are acquainted will accomplish a cure; but, in such instances, no advantage would be derived from the more violent remedies we have mentioned, and a great deal of distress would in all probability be induced by them.

C H A P.

C H A P. XXI.

Of the Paracentesis of the Abdomen.

IT is the effect of different diseases to produce collections of fluids in the cavity of the abdomen; the removal of which is obtained by an operation termed Paracentesis or Tapping.

There is naturally secreted into the cavity of the peritonæum, a serous exhalation, for the purpose of lubricating the surface of the intestines. A variety of causes may concur to produce a morbid increase of this secretion; and whenever the quantity of fluid collected in the abdomen is considerable, it constitutes a disease termed Ascites.

This

This species of dropſy often occurs as a ſymptom of a general affection, being frequently combined with anafarca; but on many occasions it is perfectly local, and is evidently induced by compreſſion of the lymphatics, by ſchirrous ſwellings of ſome of the viſcera, and particularly by enlargements of the liver.

The preſence of a fluid in the cavity of the abdomen, is known by the ſwelling which it produces; by a ſenſe of tightneſs in the parts affected; by the breathing being difficult and laborious, eſpecially when in a horizontal poſture; and by a ſenſe of fluctuation being communicated to the fingers placed on one ſide of the abdomen, when the ſwelling is forcibly ſtruck on the oppoſite ſide. A concurrence of theſe circumſtances will always, to a diſcerning practitioner, point out the real nature of the diſorder; but a farther confirmation is obtained of it when the patient complains of much thirſt, a dry ſkin, ſcarcity of urine, and other ſymptoms of dropſy.

When the ſwelling is found to extend
equally

equally over the abdomen, the water is commonly diffused among the different viscera, and is contained within the peritonæum only. It sometimes, happens, however, that the fluid is collected in different cysts, or perhaps in one or other of the ovaria; in which case, the tumor produced by it is not commonly so equal, nor is the fluctuation altogether so distinctly perceived, as when the water flows freely through the whole cavity. This circumstance of fluctuation depends also on the consistence of the collected fluid; for, on some occasions, the contents of such tumors are found to be thick and gelatinous, whilst most frequently they are thin and perfectly serous. In some instances, too, an innumerable quantity of small hydatides are found swimming in the water of ascitical swellings.

Whatever may be the influence of diuretics and other evacuants in the cure of general hydropic affections, they are very rarely, as we have elsewhere observed, found to prove serviceable in local disorders
of

of this kind. The principal object, therefore, of practitioners ought here to be, to evacuate the water collected in the abdomen, by a surgical operation, as soon as its existence is freely ascertained; while the most effectual remedies should in the mean time be employed for preventing a recurrence of the swelling, by endeavouring to remove the cause which produced it. In many instances, this is indeed impracticable: But, in some cases, cures are effected; and they would probably be more frequently obtained, if the fluid collected in the belly was more early discharged. But in general it is delayed till it is too late to have any effect; for the bowels must surely suffer irreparable injury by being so long soaked in water, as is usually the case in ascites, before the operation is undertaken. This, too, is the more surprising, as the operation of tapping is in itself exceedingly simple. It is productive of little pain; and any danger attending it does not proceed so much from the nature of the operation, as from the constitution

stitution being, in general, much debilitated by the long continuance of the disease before it is performed; which renders it liable to consequences which otherwise would not occur, and which frequently terminate fatally. I am so perfectly convinced of this, indeed, that I have commonly been in the practice of drawing off these collections as soon as a fluctuation can be distinctly perceived; and I have never been sensible of any detriment occurring from it.

In large collections of any kind of fluid, and wherever they are situated, but particularly in such as occur in the abdomen, where a great number of large blood-vessels are surrounded by them, it is found to be extremely hazardous to discharge their contents suddenly; owing, as we suppose, to the immediate influence produced upon the circulating system, by a considerable part of it being too quickly deprived of a support which it has been long accustomed to receive.

But whatever may be the immediate
cause

cause of the symptoms which ensue from sudden evacuations of this kind, the effect is always certain. Syncope is a common occurrence ; but in many instances death itself has been induced by it. This, in former times, rendered tapping a hazardous operation ; and when the collection was large, in order to avoid those inconveniences which always occurred from drawing the water off at once, it was done at different times, a day or two being commonly allowed to intervene between one operation and another.

This, however, proved very inconvenient and distressing ; and by the frequent introduction of the trocar which thus became necessary, mortification of the wounds, and other troublesome consequences, were frequently induced.

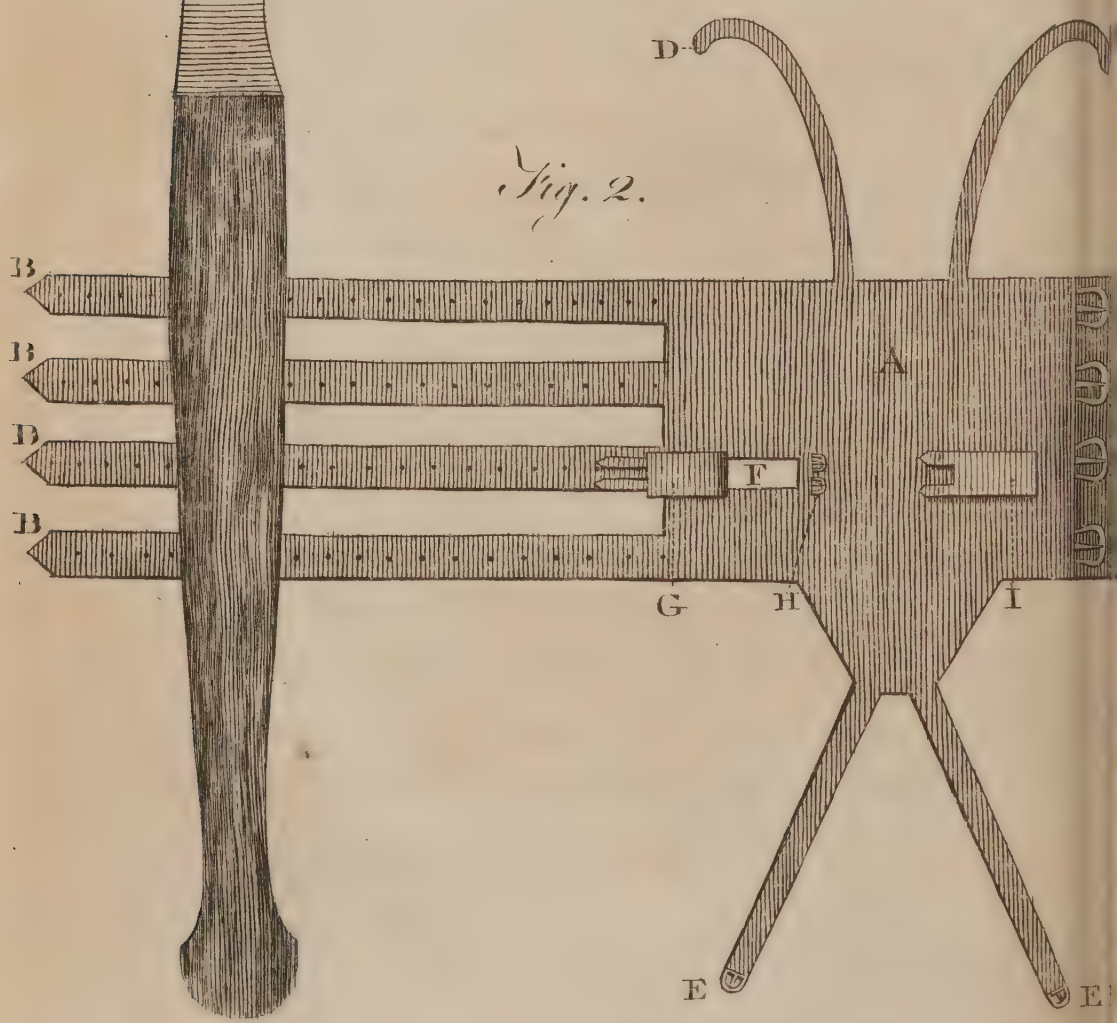
The late Dr Mead, reflecting on the probable cause of those symptoms which occur from the sudden discharge of large collections of water, was induced to try the effect of pressure upon the parts affected, as a substitute for the support of which they
are



Fig. 1.



Fig. 2.



are deprived by the evacuation : And the success attending the practice has fully justified the ideas entertained of it ; for when pressure is properly applied, almost any quantity of water the abdomen can contain, may with safety be drawn off. It ought, however, to be applied with as much equality as possible, over the whole belly ; and it should be continued without interruption for the space of several days at least.

Various means have been proposed for applying an equal degree of pressure in this operation ; but none of these answers the purpose so easily, and with so much effect, as a bandage invented by the late Dr Monro, represented in Plate XXII. Two different sizes of this bandage should be always in readiness ; and they should be made so large as to cover the whole abdomen, and to press with equality upon every part of it.

It is not necessary to recapitulate the means used in former times, for evacuating the water in dropsies : For they are now very universally, and with much pro-

priety, laid aside ; and the trocar only is at present employed for this purpose. This instrument, till of late, was always of a round form with a triangular point. As this form, however, is evidently ill calculated for an easy entrance of the instrument, an object of great importance in every operation of this kind, I was led a good many years ago to the use of a flat trocar with a lancet-point *. This has always answered the purpose with much ease ; but some improvements have been proposed upon it, by which the entrance of the instrument is still more easily accomplished.—In the first volume of this work, Plate X. I have already delineated a very neat invention of this kind, by Mr Andr  e. —It has been objected, however, to this instrument, and I believe with good reason, that the canula, by consisting of two sides which fall together with some force on the stilette being withdrawn, may thus lay hold of a portion of intestine ; and if it should

* See Treatise on the Theory and Management of Ulcers, &c.

should ever do so, a great deal of distress might ensue from it. I have now however, in Plate XXI. the satisfaction of exhibiting an improvement upon the trocar, to which no such objection can apply: It enters with the same ease as a lancet; and the two sides of the canula, by not falling close together, can never injure the intestines.

In performing the operation, it has been said, that the opening may be made with almost equal propriety in any part of the inferior boundaries of the abdomen. This, however, is by no means the case: For, in the centre of the abdomen, immediately below the umbilicus, and in the course of the recti-muscles, it might probably fall upon the epigastric artery; and, if carried near to either of the ossa ilia, the intestines would more readily be injured than if made nearer to the umbilicus. The most approved part for the perforation seems to be, at a point lying at nearly an equal distance between the umbilicus and the centre of the spine of the Ilium. No large blood-vessels can be wounded here.—The

abdominal parietes are not in this part altogether tendinous; but are somewhat fleshy, so that they more readily heal when wounded.—None of the intestines can in this situation run any risk of being wounded; and when the patient is laid in a horizontal posture, in which he ought always to be during the whole course of the operation, the point above mentioned will be found to be more depending than perhaps any other.

The operation being determined upon, the method of performing it is as follows. The point we have mentioned as the most proper for perforating ought to be marked with ink: And in applying the bandage, Plate XXII. one of the openings in it ought to be placed exactly opposite to this mark. The bandage being accordingly applied in this manner, and the straps being put through the buckles, and drawn a little tight, the patient should now be laid in a horizontal posture, with the side in which the perforation is to be made lying over the side of the bed. The surgeon is now
to

to take the trocar in his right hand ; and fixing the head of the stilette in the palm of it immediately below his thumb, while his fore-finger directs the point of the instrument, he is now to push it forward till he is satisfied that the extremity of the canula is fairly through the muscles, and lodged in the cavity of the abdomen ; which he may be certain is the case, as soon as he finds no farther resistance to the stilette. The stilette is now to be withdrawn, and the water allowed to flow as long as any of it can be drawn off, care being taken to pull the straps of the bandage gradually straiter as the water is discharged ; or, if the patient, notwithstanding this precaution, should happen to turn faintish, it may be proper to put a total stop to the evacuation for a few minutes every now and then, which is easily done by the surgeon from time to time placing his finger upon the mouth of the canula.

It sometimes happens in the course of the operation, that the discharge stops before the swelling is much diminished : When

this is owing to a portion of omentum or of intestine stopping up the extremity of the canula, the discharge is easily renewed by inserting a blunt probe into the canula, so as to push back whatever may have plugged it up; or when the serum is found to be thick and gelatinous, in order to effect a complete evacuation, it may sometimes be necessary to introduce a trocar of a larger size than the one first employed. But when it proceeds, as it sometimes does, from the water being collected in particular cysts, no attempt of this kind will have any effect; and, in such circumstances, the canula must be withdrawn, and the wound being covered in the ordinary way with a pledgit of any simple ointment, the operation may be renewed either immediately or on the following day, on the opposite side of the abdomen; or if the swelling should happen to be confined to any other part of the belly, the perforation must be made in the most depending part of it, wherever that may be.

Dropfical swellings of the ovaria exhibit
nearly

nearly the same appearances with encysted dropsies of any other kind : Only, in collections of this kind in the ovaria, the fluctuation of a fluid is not commonly very distinct ; and unless they are complicated with ascites, the swelling is commonly fixed on one side of the abdomen.

The propriety of drawing off the water by a perforation, is here, however, equally obvious as in any other species of the disease.

The water being all drawn off, and the wounds dressed in the manner above directed, the bandage, as we have said, must still be continued of a sufficient tightness for preventing any uneasiness from the evacuation of the water ; and we even suppose, that the support which the bandage affords to the weakened parts may have some effect in preventing a return of the disorder ; but when notwithstanding of this, and of such internal remedies as are employed, the water is again found to collect, the operation should be repeated whenever the swelling has acquired any considerable size.

The disease we have just described is by much the most frequent species of swelling to which the abdomen is liable ; but in some instances swellings of this cavity are of a different nature, and, instead of water, are found to contain air, constituting a disease termed Tympanites.

The effect produced by this species of swelling upon the breathing, is nearly the same as what occurs from watery collections ; but the swelling itself is much more tense than the other, and affords to the touch and pressure nearly the same sensation as is received from a bladder filled with air.

In many cases of tympanites, the air after death has been found collected in the intestines ; which, in some instances, have been inflated to a most enormous size. This we suppose to proceed from the intestines losing their tone. But there is another variety of the disease, in which the air is diffused in the cavity of the peritonæum, in a similar manner to water in cases of ascites. I have seen one instance
of

of this, and I have heard of another which happened lately in this place ; but in both of these the air was found to have escaped from the intestines by a very small hole which was discovered in one of them. I am therefore inclined to believe, that this species of the disorder very rarely proceeds from any other cause, than from a communication of this kind between the intestines and cavity of the peritonæum ; and if it is so, no remedy will ever be able to effect a cure. But from whatever cause the disease may have originated, and whether the air should be contained within the bowels themselves, or diffused in the cavity of the peritonæum, no doubt should be entertained of the propriety of discharging it, as soon as it is found to have brought the life of the patient into danger. And it may be easily done in the very manner we have directed for ascites ; taking care to use a trocar of the smallest size, and to employ pressure in the same guarded manner as when the tumor is formed by water. For as the air will produce nearly the same effects

effects by pressure upon the neighbouring parts as water, it is equally necessary to employ such a degree of compression after it is evacuated as will obviate the effects of abstracting it. Making a perforation into the abdomen for air collected in the intestines, is no doubt a very formidable operation, and ought not to be attempted but in cases of real necessity; but as death has often ensued from this variety of the disease, and of which I have met with different instances, I am clearly of opinion, when all the usual remedies prescribed by the physician for removing it have failed, that the assistance of surgery should always be desired, rather than allow such patients as labour under it to die in certain misery. The same remedy has frequently been employed with safety and advantage for the evacuation of air collected in the stomach and bowels of other animals; so that there is reason to imagine that it would be attended with similar effects in the human species.

After the operation of tapping, whether

ther in cafes of afcites or collections of air, we are commonly advised to rub the abdomen frequently with aftringent fpiritous applications. This can never do harm ; and as it may fometimes ferve to reftore the tone of the integuments, and as the friction employed in it may poffibly have fome effect in promoting abforption, it ought never to be omitted. For the firft two days after the operation, it cannot be employed, as during that period it would be very improper to remove the bandage : But this being elapsed, the bandage may be removed daily for about a quarter of an hour at once, for the purpofe of applying camphorated fpirit of wine with ftrong frictions over the abdomen ; care being taken to preferve the body during the time of it in a horizontal pofture, and to renew the application of the bandage as foon as it is over.

C H A P. XXII.

Of the Paracentesis of the Thorax.

SECTION I.

General Remarks on this Operation.

THE operation of the paracentesis or tapping of the thorax, is necessarily indicated, when the action either of the heart or of the lungs is impeded by fluids collected in the cavity of the chest. A free uninterrupted motion of these organs, we

we know to be highly requisite for the support of life ; so that all the power of art should be employed to remove whatever may occur to obstruct it ; and when the collection of a fluid is found to be the cause, little dependence can be placed on any remedy, but an immediate discharge of it by perforation.

This operation has in general been considered as applicable to the evacuation of water or of pus only ; and chiefly of the latter in the disorder termed Empyema. But after much attention to the subject, and having had several opportunities of practice in cases of this kind, I am clearly of opinion, that a perforation is equally proper for the discharge of any other fluid, as for collections of water or of purulent matter.—The symptoms induced by collections of different fluids, may vary in some points according to the nature of the disease, or of the accident giving rise to their formation. But it is their effect on the motion of the heart and of the lungs, to which practitioners ought chiefly to attend ;

tend; and this will always depend in a great measure on the quantity of fluid that is collected, independently of every other circumstance.

The different kinds of fluids met with in the thorax, and requiring to be evacuated by a perforation, are, serum, blood, pus, and air.—Of these we shall treat in separate sections.

SECTION II.

Of Serum collected in the Thorax.

COLLECTIONS of water or of serum are found to form in every cavity of the body, and not unfrequently in one or both divisions of the chest. Water in the chest is frequently combined with dropfy in other parts: But many instances occur, where

where it is merely a local affection ; and it is in these chiefly, that any advantage is to be expected from a chirurgical operation.

Independent of general effusions of serum into the two large cavities of the thorax, dropfical collections are also met with in the pericardium, and they may likewise be confined to the mediastinum immediately below the sternum.

Various symptoms accompany watery collections in the thorax ; but it requires much attention to ascertain their existence, and especially their particular situation, with such precision as is necessary to warrant an operation of such importance as the paracentesis of the chest.

A patient complaining of a sense of weight or oppression in the thorax ; of difficult respiration ; of a more uneasy sensation in one side of the chest than in the other ; of being liable to sudden starting during sleep, from a fear of immediate suffocation ; and if, along with these, he is teased with a frequent cough ; if the
pulse

pulse is found to be small and irregular; and especially if a dry skin, a scarcity of urine, and other symptoms of dropfy occur, little doubt can remain of water being collected in some part of the chest. A sense of undulation, as of water passing from one part of the breast to another, is sometimes observed by the patient on rising suddenly from a horizontal posture; and this, we may remark, serves not only to assist in ascertaining the real nature of the disease, but to determine in what particular part of the chest the water is collected. Much attention, therefore, should be given to this circumstance; for by means of it we may commonly determine, with some precision, where a perforation ought to be made.

In order to receive every possible advantage from this circumstance, the patient should have his chest uncovered while under examination. When the quantity of water collected is considerable, it may commonly be discovered by placing one hand upon the anterior part of the ribs
near

near to the sternum, and striking with some force near to the back-bone with the other; and if an undulation is perceived in one side of the chest and not in the other, the real seat of the disease is thereby rendered evident. But when the quantity of fluid is not great, this trial is not to be depended on. In this case, a person standing behind the patient upon a chair, should be directed to take a firm hold of the upper part of his body, and to swing it repeatedly by sudden jerks from one side to another; and if water is contained in the chest, it will thus be very certainly found to undulate, and an evident noise produced by it. I have met with different instances of this, in which the existence of the disorder was thus precisely determined.

In long-continued affections of this nature, assistance in the diagnosis is sometimes obtained, from the part in which the water is collected being more prominent than the rest of the chest. It has even been alleged, that all the ribs of one side

of the thorax have, in some instances, been found considerably elevated, by the water collected underneath being in such considerable quantities as to prevent them from contracting in the act of expiration. This can only happen in the very late stages of the disorder; but when it is met with, it demonstrates to a certainty where the water is to be expected.

When water is contained in the pericardium, nearly the same symptoms take place with those which occur from dropical collections in other parts of the chest. Indeed the most accurate observation will sometimes fail in judging of this point; but in the hydrops pericardii, it is observed, that the patient complains chiefly of the middle and left side of the thorax: And Senac, in his excellent Treatise on the Structure of the Heart, mentions as a characteristic mark of this disease, a firm undulatory motion being perceived between the third, fourth, and fifth ribs on every pulsation of the heart.

As it is not in any respect necessary for
our

our subject to enter minutely into the investigation of the causes of such collections, all we shall say respecting this point is, that whatever tends to produce dropsy in other parts of the body, will have a similar effect in the formation of it here.

The existence of water in the thorax being ascertained, and the part in which it is collected being discovered, as no medicines hitherto known can be much depended on for removing it, the operation of the paracentesis should be advised, as soon as there is reason to suspect that danger may ensue from delaying it longer. Perforating the thorax is no doubt an operation of importance, and should not be recommended for a trifling affection; but it should be employed in every instance where the attending symptoms are evidently hazardous, and when no relief is obtained from other means. The method of performing it is as follows.

The patient should be laid in a horizontal posture, with the side in which the perforation is to be made lying over the bed:

A a 2

When

When in this situation, the skin opposite to the part to be cut must be pulled as much upwards as possible by an assistant, who must preserve it firmly in this situation during the operation; and the surgeon is now, with a scalpel, to make an incision of about two inches in length between the sixth and seventh ribs, in the very direction of these bones, and at an equal distance between the sternum and backbone; taking care to avoid the under border of the superior rib on account of the blood-vessels running in its groove. But although it is necessary, in order to obtain sufficient freedom for the scalpel, to have the opening in the skin and cellular substance of this length, there is no reason for continuing it of the same extent to the bottom; so that, as the knife passes through the intercostal muscles, the incision may in a gradual manner be diminished to the length of an inch. On the pleura being laid bare, it is to be slowly and cautiously divided, in order to avoid all risk of wounding the lungs, in case they should at this place

place happen to adhere. If they do not adhere, the water will rush out with great force immediately on a small hole being made in the pleura; but if an adhesion should unfortunately occur here, the incision may be either continued forward for an inch or two nearer the sternum, or another opening may be made either an inch or two higher or lower in the thorax. As soon as water is found to flow, the silver canula, Plate XXI. fig. 5. should be introduced at the opening; by which means the discharge will not only be more easily accomplished, but will likewise be more readily stopt, if this should be found necessary, by the patient becoming faint. By this means also, air is prevented from finding such ready access to the cavity of the chest; a circumstance of some importance in this operation.

When the water collected is not in great quantity, it may commonly be all drawn off at once; but as we are, from the structure of the thorax, deprived, during this operation, of the advantage of com-

pression, except of that which may be communicated through the abdomen, which must here be very limited, when much water is collected partial evacuations ought to be made, at longer or shorter intervals according to circumstances. For this purpose, and with a view to suspend for a time the discharge of water, the canula should be secured by a ribbon connected with it tied round the body of the patient; and it should be stopped by means of a piece of cork adapted to its opening. A pledgit of emollient ointment should be laid over the wound; and the whole being secured by the napkin and scapulary bandage, the patient should in this state be laid to rest. After a suitable delay of perhaps a day or two, an additional quantity of water may be drawn off: And by thus taking it away in a gradual manner, all risk may be avoided of injuring the patient by too sudden an evacuation.

In this manner any quantity of water contained in the chest may be drawn off with safety; and the patient being now relieved

lieved from the great distress under which he laboured, the canula may be withdrawn, proper means being at the same time employed for preventing a relapse of the disorder.

We have hitherto proceeded upon the supposition of the water being collected in only one of the cavities of the chest; but when both sides of the thorax are affected, the water cannot be all drawn off by one operation. In such a case, therefore, after it has been evacuated from one side, the operation should be repeated on the other. But some risk might occur from performing the operation in both sides at nearly the same time, by the external air getting access at once to both cavities of the chest: For although we have directed the opening in the pleura to be very small, and a canula to be immediately inserted into it, yet still it is impossible, even with the utmost caution, to prevent the air so effectually as we could wish from finding access, either by the wound or by the canula, to the surface of the lungs; and if both

cavities of the chest should at the same time be filled with air, nearly the same oppression would occur upon the lungs as was produced by the serum newly evacuated. Before the operation, therefore, is repeated on the opposite side, some method should be attempted for expelling the air received into the cavity of the chest by the perforation already made. This may be done by two different methods; the most easy and convenient of which is this: Immediately after the canula is withdrawn, let the patient endeavour, as far as he dare safely venture, to fill the lungs with air. This will expel a considerable part of what was collected between the pleura and lungs, by the perforation; and if the skin, which was retracted before the operation, be instantly drawn over the fore, and pressed down by an assistant during inspiration, all access will thus be prevented to the external air; and by repeating this different times, almost the whole quantity of air collected between the pleura and lungs may be expelled: After which the
skin

skin must be drawn over the wound ; and by means of a comprefs and bandage properly applied, the parts may be brought to adhere without any further trouble.

The other means we wish to propofe for drawing off the air from the thorax is by fuction. An exhaufting fyringe may be fitted with fuch a mouth of ivory or of metal as will allow it to be clofely applied over the opening in the pleura. When thus applied, every ftroke of the piston will extract a confiderable quantity of air ; and as foon as the whole is fupposed to be nearly exhaufted, the inftrument may be removed, and the wound treated as we have already directed, by drawing the fkin over it, and endeavouring to heal it by the firft intention.

Or, inftead of an exhaufting fyringe, one of the elastic vegetable bottles, fitted with the fame kind of mouth, will anfwer the fame purpofe. By expelling all the air out of the bottle, and applying the mouth of it over the wound in the pleura, a quantity of air nearly equal to the bulk of the inftrument will be extracted, and the application

plication of it can be renewed as often as may be necessary ; care being taken at each removal of the instrument to exclude all access to the air, by drawing the retracted skin over the wound.

Air collected in considerable quantities in the cavities of the chest, may not only prove hurtful by impeding the motion of the lungs, but it must likewise do harm by that tendency to inflame, which is always communicated to parts naturally secluded from the external air, on their being by accident laid open so as to admit of its being freely applied to them. In every case, therefore, of this nature, much attention should be given to this circumstance. When one side only of the thorax is laid open, either in collections of water or of matter, the oppression produced upon the lungs by the admission of air through the wound, is not commonly of much importance, as it is in general expelled by the effects of expiration alone. This I know from experience, is the case ; but inflammation, as we have said, being sometimes induced

induced by air finding access to any of the cavities, it ought at all times to be guarded against as much as possible; and, as much distress has on some occasions ensued from both cavities of the chest being at the same time laid open, it ought never to be attempted.

Our views in what we have ventured to advise in the different steps of the operation, will appear, we hope, sufficiently obvious; but as some surgeons prefer a different part of the chest, as well as a different instrument, for performing the operation, we think it necessary to enter somewhat more minutely into the consideration of these points.

It has been said, that unless the opening be made lower in the chest than we have advised, the water will not be completely evacuated, as all that part of the cavity lying below the wound will still continue to be filled with it. But, if the patient be laid in a horizontal posture, with his body inclined a little to the side in which the perforation is made, the spot
we

we have recommended will be found to be the most depending of any that can be fixed upon; and in this situation we have this material advantage, that the lungs do not so readily adhere to the pleura, as they do farther down, where they come more closely into contact with the diaphragm; and here too, the perforation is effected with much more ease than it can possibly be nearer the spine, where the thick fleshy muscles of these parts cannot be avoided.

With respect to the instrument with which the operation is performed, the scalpel, we think, is by much the best that can be used. A trocar has been recommended for this purpose by many: But however well adapted this instrument is for piercing the abdomen or the scrotum, in which none of the contained parts can be injured by it if the operation is cautiously performed, yet in the thorax considerable risk must commonly attend the use of it from the adhesions which often occur of the lungs to the pleura, and from our not being previously able to determine
whether

whether they may not adhere at the very point in which the perforation is made.— In the event of no adhesion being met with, the trocar would no doubt effect the intention of the operation very completely, and with perfect safety if it is cautiously introduced. But if it should unfortunately be introduced at a part where the lungs adhere, it would not only injure that organ in a very material manner, but it would not answer the purpose for which it is employed ; for the instrument entering the substance of the lungs, would not come into contact with the water collected between the lungs and the pleura lining the ribs, and consequently no evacuation would ensue. With the scalpel, however, no such inconvenience can occur. On the pleura being laid bare, a small hole must be scratched in it with the point of the instrument ; and as soon as the surgeon has reason to think that this membrane is completely penetrated, if no water is evacuated, there will be much reason to suppose that the lungs adhere at this place ; and he will now either desist altogether,

altogether, and make an attempt at another place; or, if the adhesion of the lungs to the pleura is slight, which may be known by the cautious introduction of a blunt-ended probe, as much of them may possibly be separated as to admit of the introduction of a canula into the collection of water: At least such a trial may be always made with safety. If the separation of the lungs is easily effected, and if the adhesion is not very extensive, the operation will be thus completed; and if the contrary should unluckily happen, the operator will at least have the satisfaction of having done no mischief, which he could not however, in such circumstances, avoid in employing the trocar. After duly attending, therefore, to every circumstance, we are clear in opinion, that the scalpel should in this operation be preferred to the trocar.

We have hitherto been supposing, that the water is collected in one of the large cavities of the thorax. But when it is contained in the pericardium, or confined
in

in a cyst between the two lamellæ of the mediastinum, what are we to attempt for removing it? It has commonly been supposed, in dropfical collections in the pericardium, that no advantage would be obtained from discharging the water, as the success attending the practice would probably be very uncertain, and that more danger might occur from the operation than from the disorder itself; and accordingly, patients labouring under this disease have been uniformly left to their fate, for few indeed have been the cures effected by medicines.

But although the success resulting from this operation would not probably be very considerable, yet still a few of the great number at present carried off by the disease might possibly be saved, and they could not in all probability be brought into a more dangerous situation than is induced by the disorder itself: For few, if any, recover, of all that are seized with a real hydrops pericardii; and we have no reason to suppose, that a mere division of
that

that membrane is in itself attended with such danger as on this account to warrant a total rejection of this operation. Indeed different instances have occurred of people recovering of wounds accidentally inflicted on it.

When, therefore, it is either previously suspected that the water is collected in the pericardium, or when it is in reality found to be so on an incision being made into the left cavity of the chest, no doubt ought to remain of the propriety of making a perforation into it.

In dropsies of this part, the pericardium is in general so much distended, that no difficulty can occur in finding it. Upon making an opening into the left side, between any two of the ribs from the third or fourth to the seventh or eighth, and within the distance of five or six inches of the sternum, we will in this distended state of it be sure to meet with it: And when it is brought fully in view, by the pleura being freely divided for the space of about an inch, which will commonly be found
necessary,

necessary, the best method of finishing the operation, is by pushing a small trocar with much caution and steadiness into the pericardium; and if the quantity collected is small, it may all be drawn off at once: But, when considerable, the discharge ought by all means to be frequently stopt for a few minutes together, with a view to prevent those inconveniences we have so frequently had occasion to mention as the consequence of large collections of fluids being suddenly evacuated wherever they may be situated; and if this precaution is necessary in other parts, it must probably be much more so in a situation so very contiguous to the heart.

When, again, water is collected in a cyst between the lamellæ of the mediastinum, as this is situated immediately below the sternum, any pain or oppression which occurs from it, will be more confined to the centre of the breast, than when the collection is situated in either of the cavities of the chest; and for the same reason, any opening intended to discharge it must be made directly through the sternum it-

self, by a piece of that bone being taken out with the head of a trepan, so as to admit of the parts affected being brought clearly into view. The method of applying the trepan we need not now enter upon, as we shall have occasion to treat of it more particularly in a different chapter than would be necessary here: And all that we think requisite to say farther upon the subject is, that as soon as the cyst containing the fluid is laid bare, a perforation should be made into it with a trocar; care being taken to manage the evacuation of it in the same cautious manner we have already directed, and not to admit of the parts newly laid open being more exposed to the influence of the air than is merely necessary.

SECTION III.

Of Blood collected in the Thorax.

WHEN blood is collected in considerable quantities in any part of the chest, the breathing becomes oppressed, and the motion

motion of the heart and arteries feeble and irregular. These, indeed, are symptoms which occur in every collection seated in the thorax; but they are observed to arrive at a greater and more distressful height from blood, than from collections of other fluids. In other respects, collections of blood and of serum give rise to the same symptoms, so that we need not again enumerate them particularly.

Different causes may occasion extravasation of blood in the cavity of the thorax.

1. Wounds of any of the blood-vessels contained in the thorax, by the forcible introduction of sharp instruments.

2. The spiculæ of a fractured rib forcibly pressed upon any of the arteries or veins, and splinters of the sternum or of any of the vertebræ, may also be attended with this effect.

3. The erosion of any of these vessels, by the matter of an ulcer or of an abscess; and,

4. The rupture of these vessels by any
B b 2 violent

violent exertion, particularly by the action of coughing.

As it commonly happens, where blood is collected in the chest, that the vessels from whence it is evacuated are seated in the substance of the lungs, part of the blood is usually brought up by the mouth in a fit of coughing; and when the quantity discharged in this manner is considerable, it proves a temporary relief to the oppression both of the lungs and of the heart.—But whenever the action of either of these organs becomes much impeded by a great accumulation of blood, some attempt ought to be made to draw it off by a perforation: And as blood, when extravasated, coagulates very quickly, and as in this state it would be discharged with difficulty, an opening should be made for this purpose as soon as there is the least reason to imagine from the symptoms that it is beginning to stagnate.

When blood extravasated in the thorax is found to be so firmly coagulated as not to pass off by a perforation, it has been
proposed

proposed to dissolve or to dilute it by injections of warm water or of emollient infusions. This however is a practice which if possible ought to be avoided; for injections, even of the mildest nature, must in this situation be always attended with much risk; but when it so happens, that a considerable quantity of blood is collected in a coagulated state, and that it cannot be evacuated even by enlarging the opening in the pleura to the extent of an inch or so, and as much hazard would be incurred by allowing it to remain, even a doubtful remedy in such circumstances becomes eligible.—In this situation, tepid water being frequently and cautiously injected, and especially if small quantities of it are allowed to remain in the chest for some time together, which may be done by the injection being thrown in while the orifice is somewhat elevated, the coagulated blood may in this manner be gradually so much softened and dissolved as to be at last evacuated. But when a practitioner has it in his power to make a

choice, it will be much for the interest of his patient, that he prevents the necessity of employing such a remedy, which he may commonly do by making an incision in the manner we have directed in that part of the thorax where the blood appears to be collected.—By some practitioners, particularly by Mr Sharpe, we are advised, in cases of blood collected in the thorax, rather to trust to its being absorbed or coughed up from the lungs, than to endeavour to draw it off by this operation*. —Where blood is either extravasated in the substance of the lungs, and is freely spit up, or when it is even collected in any of the cavities of the chest, if it is in such a small quantity as to produce no material impediment to the action of the lungs or of the heart, it may possibly be right to make no attempt for discharging it, as in course of time, by blood-lettings being frequently repeated according to the strength of the patient; by the effects of a low cooling diet, and other remedies

* Treatise of the Operations of Surgery, chap. xxiv.

medies usual in such cases, it may perhaps be absorbed; and in the mean time, while the quantity extravasated is inconsiderable, no material inconvenience can arise from it. But what we wish to inculcate is, that when blood is collected in such a quantity in either of the cavities of the thorax, as to disturb the functions of the organs contained in it, it ought by all means to be immediately drawn off by a perforation. It is said by Mr Sharpe, that, by allowing the blood to coagulate in the chest, the orifice from whence it is poured will be more readily stopt, than if it be quickly evacuated. But in answer to this, we must remark, that if the wounded vessel is not of a considerable size, little or no additional risk will be incurred by drawing off the blood as it is poured out, as in this case the hemorrhagy will probably stop on the patient's becoming faint: And on the contrary, if the divided vessel is large, the remedy proposed by Mr Sharpe will be found very insufficient for the purpose; for a wound in any of the large vessels of the

B b 4 breast,

breast, will probably prove fatal, whether the operation of the paracentesis be performed or not.

In performing this operation for blood collected in the thorax, the directions we have given for evacuating serum will in general prove applicable. Only, when the collection has been the consequence of a rupture of a blood-vessel, induced either by a fractured bone, or by some extraneous body being pressed into it, the incision ought to be made as contiguous as possible to the part affected, so that the opening may serve not only for evacuating the blood, but for extracting such portions of bone as are found to be detached, or such foreign bodies as may be met with. And again, when a wound with a sharp-pointed instrument is the cause of the collection, instead of making a perforation in any other part of the chest, it will commonly answer the purpose better, merely to enlarge the wound; at least, this will always be preferable, when the wound is situated in the inferior part of the thorax; but when it is
found

found to be so high in the chest, as to be unfit for evacuating the blood contained in it, the operation must then be performed between the seventh and eighth ribs, as we have already pointed out.

SECTION IV.

Of an Empyema, or a Collection of Pus in the Thorax.

COLLECTIONS of pus in the thorax are more frequently met with than of other fluids, and the symptoms produced by them are nearly such as occur from similar quantities of any other fluid ; at least, the marks of oppression on the heart and lungs which occur from them, are very similar to those which arise from collections of serum : But where pus is collected, we have symptoms of a different kind, that direct us in forming an opinion, not only of the nature of the disorder, but of its particular seat.

It

It has been asserted, that pus has in some instances been deposited in particular parts, without any previous inflammation. But this is acknowledged to be so rare an occurrence, that we may venture to lay it down as a fixed principle, that inflammation is to be considered as a necessary forerunner of purulency ; so that an empyema, we conclude, will never be met with, but as a consequence of an inflamed state of the part affected. When, therefore, such symptoms occur, as indicate a collection of some fluid in the thorax, if they have not been preceded by an inflammatory affection of the part, we may conclude that they are not induced by purulent matter. But when a patient who has for some time complained of a fixed pain in some part of his chest, attended with heat, a quick pulse, and other symptoms of inflammation, is at last seized with an oppressed respiration ; an inclination to sit in an erect posture ; with a total inability of lying on the sound side ; a constant tickling cough ; with frequent rigors or shiverings ;

verings; and especially if these symptoms are accompanied either with an enlargement of the affected side, or with a soft œdematous fulness of the part in which the pain was at first seated; we may conclude with much certainty, that a large collection of matter is formed.

Inflammation of some portion of the lungs, or of their coverings, may be induced by various causes. In some instances, families appear to have an hereditary tendency to tubercles in the lungs, which every slight attack of cold is apt to affect with inflammation. A natural contracted state of the thorax seems likewise to predispose these parts to inflammatory affection; and inflammation may be produced here, in the same manner as in other parts of the body, by every variety of external violence.

But by whatever means the contents of the chest may have been brought into an inflamed state, when this terminates in suppuration, if the matter, instead of being freely discharged by the mouth, as is frequently

quently the case, is found to produce all the symptoms we have already had occasion to enumerate of an oppressed respiration, the only remedy upon which we ought to place any dependence is a perforation.

Many practitioners have considered this operation as more hazardous than it really is; and it has been said, that it ought never to be attempted but when the seat of the abscess is clearly pointed out by an external swelling between two of the ribs. When the lungs become inflamed in a part which adheres to the pleura, abscesses of this nature are not unfrequently formed; and they are accordingly very commonly laid open. But although the operation of which we are now speaking is of some importance, and should never be employed but when indicated by necessity; yet we do not think it can ever be attended with so much risk as to render the formation of an external abscess the only cause for performing it. When there is reason to conclude, that previous inflammation in some part of the breast, with evident marks of this having

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ving terminated in suppuration, is the cause of an oppressed breathing, and when this is not quickly relieved by a free expectoration of matter, the operation of the paracentesis should be performed immediately on that spot where the collection is supposed to be seated, whether there are any external marks of an abscess or not. It may frequently happen, that no matter will be discharged on the perforation being made into the chest; as we know from experience, that in cases of this nature the abscesses are often seated in the substance of the lungs, and not in any of the cavities of the chest. But, even in such instances, an opening of this kind may be sometimes of use; as the lungs, by losing their usual support at a particular point, will more readily yield than they otherwise would do to the matter collected in them; and in the event of the matter being already poured into the cavity of the chest, the remedy we are now recommending is the only resource from which any real advantage is to be expected. I am therefore clearly of
opinion,

opinion, that, in every case of this nature, the paracentesis of the thorax should be universally employed.

The directions we have given in the two preceding sections for effecting this operation, will apply with equal propriety in collections of pus: Only, it must here be remarked, that in affections of this nature, whenever the seat of an abscess is pointed out, either by a long continuance of pain in any one point, or by matter being distinguished between two of the ribs, that this is by much the best direction for the place of the incision. But when no such mark is to be met with, the place we have advised for the operation when water or blood is to be evacuated, will answer equally well for the discharge of matter.

It is likewise necessary to observe, that, in purulent collections in the chest, proceeding from external injuries, particularly from penetrating wounds, no operation can be necessary if the wound producing the abscess is so situated as to evacuate the matter completely; but when the wound
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is found to be too high in the thorax for answering this purpose, a perforation in a more depending situation is thus rendered proper. And, again, when the matter is seated so immediately below the sternum that it cannot be evacuated by an opening between two of the ribs, a piece of that bone must be removed by the trepan, as we have already directed when speaking of collections of serum.

In purulent collections in the thorax, the matter is commonly first formed in the substance of the lungs, and is afterwards discharged into one or other of the cavities of the chest. But in many instances, large quantities of pus are found between the pleura and surface of the lungs, without any apparent affection of that organ; and proceed evidently from an inflamed state of the pleura lining the ribs, or of the investing membrane of the lungs. These collections, however, seldom continue long without producing ulceration; and when ulceration has taken place, the discharge of matter which follows upon the paracentesis

centesis being performed, generally continues for a great length of time.

Different causes concur to render the cure of abscesses in the breast more tedious than in other parts: The constant motion of the lungs; our not daring to induce that degree of inflammation which we know to be necessary for the reunion of parts divided by the formation of matter; and our being precluded from receiving any benefit from compression, which the intervention of the ribs renders impracticable. Although, in a few instances, the quantity of matter gradually diminishes, and the external opening contracts and heals; yet, from the circumstance we have now mentioned, in a great proportion of those who have undergone the operation for the empyema, or who have had large collections of matter in the breast in consequence of accidental wounds, a discharge of matter continues for a considerable time, most frequently for life. The sore, indeed, will often heal if it be not artificially kept open; but the matter almost constantly
bursts

bursts out again, or another operation becomes necessary to discharge it, when it collects again in such quantities as to produce a renewal of the symptoms of oppression on the lungs and heart.

We shall have an opportunity of considering this subject more fully when treating of wounds of these parts. In the mean time, however, I think it necessary to observe, that although, in the treatment of wounds, the general use of tents, whether solid or hollow, has been condemned with much propriety; yet we are evidently misled by fashion, when we lay them entirely aside in wounds penetrating the cavity of the breast. I know that it is the opinion of many practitioners of eminence, that tents of every kind should be entirely exploded; but I also know, that patients, who might otherwise have been saved, have frequently suffered by this rule being too generally adopted. Thus, in the case now under consideration, as long as the matter of an abscess in the thorax continues to find an easy vent, and to be discharged freely ei-

ther by the wound which first produced it, when this is sufficient for the purpose, or by a perforation made for drawing it off, when this is found to be necessary, there is no cause whatever for employing tents ; and in such circumstances, indeed, it would be highly improper to use them. But when the opening in the thorax heals too quickly ; when, in consequence of this, the matter of the abscess does not find a free vent, and symptoms of oppression in the breast supervene ; in such circumstances, the propriety of preserving a passage for the matter must be self-evident. Repeated experience has convinced me, that this may be done with much ease, by introducing a piece of common bougie into the opening, or a short tube of silver, and allowing it to remain for a few hours, as often as a tendency in the part to heal seems to make it necessary. By a neglect of this means, and by allowing such sores to heal, which is now the most frequent practice, much mischief has often been done ; and, on the contrary, I know different instances
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of people enjoying very good health by a proper attention to this circumstance; who constantly experience much inconvenience from allowing the openings into the chest to become much contracted; and in whom, therefore, the complete healing of them would in all probability be attended with fatal effects. Some inconvenience, no doubt, will arise from a constant discharge of matter; but no greater than what is daily experienced from a common issue, which the opening we are now speaking of nearly resembles: And at any rate, when a patient knows that his safety depends upon such a discharge, he will very readily submit to it.

We shall now proceed to the last section upon this subject, the consideration of air collected in one or in both cavities of the chest.

SECTION V.

Of Air extravasated in the Thorax.

AIR collected in either of the large cavities of the chest, produces the same symptoms of oppression on the lungs and heart, as those which occur from the presence of water, blood, or matter; it therefore becomes equally an object of surgical management.

Collections of air may be produced in the thorax by different causes.

I. We know that the process of putrefaction tends to extricate air from every body in which it takes place; so that air may be collected in the thorax, from any part of the organs contained in it being seized with mortification. This species of
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the disorder, however, will seldom fall under the care of the surgeon : For the affection by which it is produced, will not in general yield to any remedies that may be employed for removing it ; and unless the mortification be removed, no advantage can be expected from any operation.

2. Air may pass into one or both of the cavities of the chest, from a rupture produced in the investing membrane of the lungs by violent exertion in coughing, laughing, crying, &c.

3. The erosion of the surface of the lungs by ulceration, or by purulent matter in contact with them becoming acrid, may open a passage for air into one or other of these cavities.

4. Wounds penetrating the substance of the lungs have sometimes produced collections of air in the chest. But in such instances, the wound must be inflicted with a small-pointed instrument pushed in an oblique direction. No instrument carried forward in a direct line into the lungs, will produce collections of air, as all the air

which escapes from the lungs will pass out at the wound: But in the case of an oblique wound, the air may readily be prevented from escaping by it, as the parts will naturally fall together; and in this event they will operate in the same manner as a valve, and so the air must necessarily be collected in one or other of the cavities.

5. The point of a fractured rib wounding the lungs, has frequently been productive of the same effect; and a fracture of any of the vertebræ may operate in the same manner.

These several causes may occasionally induce collections of air in the cavities of the chest; but this complaint ensues more frequently from fractures of the ribs than from any of the others.

The symptoms produced by air effused in the thorax, differ only in this respect, from those which occur from serum and purulent matter, that they come more quickly to a very alarming height, there being instances of death having been induced in the space of a few hours after the fracture of a rib,
merely

merely by air collecting in such quantities between the pleura and lungs as totally to obstruct respiration; and in many instances, perhaps in the greatest proportion of all that occur, along with this collection of air in the chest, the cellular substance of the breast becomes inflated; and if means are not soon employed to prevent it, the air insinuates through every part of the body.

It is truly astonishing to observe, how quickly this accident of a fractured rib, by wounding the surface of the lungs, will in some instances induce the most alarming symptoms.—The patient at first complains of a tightness in the breast, attended with oppression in breathing, along with pain in the parts chiefly affected.—In a gradual manner, this difficult respiration becomes more distressful.—The patient cannot breathe in a recumbent posture, and is always easiest when erect and leaning somewhat forward:—The face becomes flushed and much swelled:—The pulse is commonly feeble, and at last becomes irregular:—

The extremities become cold; and if relief is not quickly obtained, the patient is sure to be carried off with every mark of suffocation.

The emphysematous swelling of the chest and other parts, which sometimes occurs here, is easily distinguished from watery effusions, by the crackling produced on pressure; the sensation it communicates being nearly such as is received from pressure upon a dry bladder when nearly filled with air. For the removal of this symptom, scarifications have been employed. By making several incisions, each about half an inch in length, along the course of the swelling, a good deal of air may be evacuated, especially if the air contained in the swelling be frequently pressed towards these openings. A considerable quantity, too, of the air collected in the thorax, will be drawn off by the same means: For, as soon as any part of it passes off from the cellular membrane, its place will be immediately supplied from the chest; and if the quantity which escapes by the wound in the lungs, is not greater than what is discharged

discharged by the scarifications, the whole in this manner may soon be removed. But it frequently happens, that the air forced out from the lungs is much more than can pass off by any number of scarifications that can be made; and in this case, any relief obtained for the most material symptom, viz. the oppressed respiration, is very inconsiderable.

Till of late patients in this situation were almost constantly left to die by suffocation; for when scarifications failed in evacuating the air, and even this remedy has not been long in use, practitioners were not acquainted with any other means of relief.—But we now know, that in all such cases, where the oppression of the lungs is great, and where the symptoms are evidently induced by air collected in the chest, that the same remedy should be employed for removing it, as is found to succeed in collections of any other fluid, viz. the operation of the paracentesis; and it has accordingly of late years been performed in different instances, and always with complete

complete success; the tension in the breast, difficulty of breathing, and every other symptom, being immediately relieved on a perforation being made thro' the pleura *.

With a view to prevent the inconveniences which result from the external air finding a free access to the cavity of the chest, it has been proposed to make the opening with a trocar instead of a scalpel; and by entering the instrument in an oblique direction, this purpose would, no doubt be very effectually answered.

When the chest is completely filled with air, and if any certainty could be obtained of no adhesions taking place between the lungs and pleura, the operation might be performed with perfect safety, and with more ease by the trocar than with any other instrument. But as we can never know with precision whether the lungs adhere or not, we are, for these and other reasons mentioned in a preceding part of this chapter, induced to think that the operation may be

* This operation for the evacuation of air from the chest, was first proposed by Dr Monro, about the year 1760, in his lectures in this University.

be done with more safety with the scalpel. And if the directions we have given are attended to, of retracting the skin as much as possible from the part to be perforated; of introducing a canula immediately into the opening of the pleura, as soon as air begins to be evacuated; and of drawing the retracted skin over this perforation into the chest, as soon as it is thought advisable to withdraw the canula: The operation may be done with more certainty of avoiding all manner of injury to the lungs, in the event of their adhering to the pleura, and probably with equal success in every respect, as when the trocar is employed.

The practice, therefore, which in every case of this nature we would incline to follow, is in the first place to make several incisions along the course of the swelling, each of a half inch in length, and of such a depth, as to pass entirely through the skin into the cellular membrane: And if these do not afford relief, which, however, they will frequently do, to proceed immediately to perforate the cavity of the chest,

chest, in the manner we have directed, and as near as possible to the part where the injury was received, when the disorder has been induced by an external accident, and if this be not near to the back-bone ; in which case, the perforation ought to be in the same part which we have directed in collections of water, of blood, and of matter. And when a violent exertion in coughing, crying, or laughing, has produced it, the particular seat of the complaint will in general be pointed out by some degree of pain in the part where the rupture of the external coverings of the lungs has occurred.

C H A P.

C H A P. XXIII.

Of Bronchotomy.

WHEN respiration becomes so much obstructed as to endanger the existence of the patient, and when this is found to proceed from some local affection of the superior part of the wind-pipe, an operation commonly termed Bronchotomy is employed for relief.—But as this consists in an opening made into the trachea, and not into the bronchiæ, it ought more properly to be named Tracheotomy.

This operation has in general been supposed to be of a more formidable nature than it really is ; and this has prevented
it

it from being so frequently employed as it ought to be.—By many practitioners, it is said to be seldom if ever necessary; and even some authors of eminence have asserted, “that it is useful only in that species of angina, where the throat is exceedingly enlarged by the swelling of the thyroid gland and parts adjacent:” These are the words of Mr Sharp in his treatise on this subject*.—But it is evident, that in this instance Mr Sharp has wrote without considering the subject sufficiently: For, although a swelling of the thyroid gland may become so considerable as to compress the trachea entirely, and may thus render bronchotomy necessary, yet this is surely a very rare occurrence; few practitioners have probably met with it; and there are not many, I presume, who have not had occasion to perform the operation on other accounts.—The danger which was formerly supposed to attend it is not now so much dreaded, and accordingly it is more frequently employed; but

* *Operations in Surgery*, chap. xxxi.

but still there is much reason to think, that it should be oftener practised than it has hitherto been.

The causes which may induce a necessity for performing this operation are :

1. Any spasmodic affection of the muscles of the larynx, when it arrives at such a height as to endanger suffocation: In some species of catarrh, the mucus of these parts becomes so very acrid, as to irritate the glottis in a most sensible and disagreeable manner. Even from this kind of irritation, it is evident by the sense of suffocation which sometimes occurs, that a considerable degree of contraction is produced in the glottis: But this takes place in a much more alarming degree, from a piece of hard substance of any kind slipping below the epiglottis into the larynx; insomuch, that instances of suffocation have occurred from this cause alone. Among others of this kind which might be recited, a remarkable history is recorded by Bonetus, of a child dying from a piece of bone having passed into the trachea arteria; and it has often happened,

happened, that children, and even older people have been suffocated by pieces of nut-shells, crusts of bread, &c. passing into the trachea.

It has been alleged, that no alarming degree of contraction in the glottis can ever probably occur; and it has even been said, that the muscles with which it is furnished are not adequate to this effect. This opinion, however, originates entirely from the very relaxed state in which these muscles are always found after death: Which is not by any means a fair method of judging; for we know well, that all the muscles in the body are found in a relaxed state after death, however severely they may previously have been contracted.

2. A piece of bone, flesh, or any other firm substance, being lodged in the pharynx, or in the upper part of the œsophagus, and being too large to pass down to the stomach, may by its bulk press so much upon the posterior and membranous part of the trachea, as to produce a total obstruction to the passage of air into the lungs,

lungs. Different instances have occurred in this place, of suffocation being induced by a piece of flesh lodging in the superior part of the pharynx: For in such instances, it commonly happens that patients are irrecoverably dead before any assistance can be procured. I have myself met with two instances of this, in both of which the utmost certainty was obtained of respiration having been obstructed for a few minutes only; and yet neither of the people recovered, although all the means usually employed in such cases were immediately put in practice. But in both, there is every reason to think bronchotomy would have proved effectual, had it been possible to procure assistance more speedily.

The event of these two cases, as well as of some others of drowned persons, in which respiration had been obstructed for a very short period only, and in which every method now known was put in practice for their recovery, makes me conclude, that few, if any, have ever recovered in whom

respiration has been totally obstructed for more than a few minutes.

After all the attention that I have been able to give to cases of this nature, I would say, that a complete interruption to breathing, for the space of five minutes only, must, in almost every instance, prove fatal. We have heard indeed of many instances of drowned people being recovered after being half an hour, nay even hours, under water: But these accounts of the time which bodies have remained immersed are seldom very accurately obtained, from the general inclination in bystanders to exaggerate, as well as from other causes; so that little or no credit is in general due to them.

3. Polypous excrescences in the nose have been known to fall so far into the pharynx as to endanger suffocation; and it very commonly happens that tumors of this kind, which originate either from the uvula or from the superior part of the pharynx, are attended with this effect; in all of these, when extirpation by ligature is to be

be attempted, if the tumors are large, it is with much difficulty that the necessary apparatus is applied. This, however, may be greatly facilitated by a previous opening of the trachea, which admits of an easy respiration while the ligature is forming round the basis of the tumor.

4. Tumors of a firm nature, particularly those of the schirrous and fleshy kinds, even when seated externally, have been known to compress the trachea so much as to obstruct respiration almost entirely : When such swellings reach so far down as to cover all the accessible part of the trachea, and which, in the latter stages of the tumor termed *Bronchocele*, is too frequently the case, this operation is rendered inadmissible ; but in all such affections much benefit may be derived from it whenever it is found to be practicable.

5. An instance is mentioned by Doctor Richter, of an inflammation of the tongue arriving at such a height as to obstruct the passage to the fauces entirely ; and different instances have occurred of mercurial

salivations, when carried too far, inducing such a tumefied state of the glands in the mouth and throat, as to be attended with the same effect. In one case of this kind which I met with several years ago, and in which the glands of the throat were naturally large, such a total obstruction was produced to the passage of the air, as rendered bronchotomy absolutely necessary. In this instance, such a quantity of mercury had been quickly thrown in, that the swelling of these glands arrived at an alarming height in the space of a few hours from its commencement; and although all the remedies usually employed in such cases were put in practice, none of them had any effect: The operation was, contrary to my opinion, delayed till the patient was almost completely suffocated; but he revived instantly on the perforation being made.

6. Swellings of the amygdalæ and contiguous parts, that do not terminate speedily in suppuration, when they arrive at any considerable bulk, are apt to induce

duce an obstructed respiration; and may thus render bronchotomy necessary. It is not such tumors, however, as originate entirely from inflammation that most frequently proceed this length: Hard swellings of the amygdalæ, when attacked with inflammation, are sometimes known to produce a total obstruction in the fauces; which none of the usual remedies will remove; and which therefore points out the propriety of this operation. But in real inflammatory tumors of these parts, constituting the angina inflammatoria of authors, unless the glands have been morbidly enlarged before the commencement of inflammation, the swelling will seldom, or perhaps never, proceed to such a height as to require it: And when swellings of this kind arrive at a considerable bulk, it will almost constantly be found to depend on their having gone into a state of supuration; when relief may be obtained by means of a more simple nature than bronchotomy, namely, by discharging the matter contained in the tumor by an in-

cision or a puncture. A common scalpel, wrapped all up with a piece of linen except at the point, is generally made use of for scarifying or puncturing the amygdalæ and other parts of the fauces ; but no precaution whatever will render this a safe instrument for these purposes, In Plate XXIV. is represented a lancet concealed in a canula, which every surgeon ought to be possessed of, as by means of it any part of the throat may be scarified with safety.

7. Among the means employed for restoring the circulation in people who have been long under water, or where respiration has been obstructed in any other manner, blowing air into the lungs, and repeatedly discharging it, is perhaps more to be depended on than any other ; for the action which is thus given to the lungs is very readily communicated to the heart itself. The usual method of throwing air into the lungs in such cases, is by blowing forcibly into the mouth while the nostrils are compressed ; or by means of a curved tube inserted at one of the nostrils, so

so as to make its extremity terminate immediately above the glottis.

But although one or other of these methods may on some occasions answer the purpose of filling the lungs with air, yet I know from experience that it will not commonly succeed. In two different instances of people who had been each of them a few minutes under water, several attempts of this kind were made for throwing air into the chest. But, either from some contraction of the epiglottis, or of the superior part of the larynx, none of them were found to succeed; and as bronchotomy was in both cases obliged to be performed for effecting it, we are therefore warranted in mentioning this as one cause which may render it necessary.

When, from any of the causes we have mentioned, respiration becomes so much obstructed as to endanger the patient's existence, bronchotomy ought to be immediately employed; and the method of performing it is this.

Whenever it is found necessary to have a patient firmly secured during an opera-

tion, he should always be placed upon a table; and as this is a matter of much importance in bronchotomy, we prefer a table to a chair. The patient being laid upon a table, with his head drawn back and limbs secured by assistants, a longitudinal incision should be made with a scalpel through the skin and cellular substance on the middle and inferior part of the trachea, beginning at the inferior part of the thyroid cartilage, and continuing it downwards for the space of an inch. The sterno-thyroidei muscles are thus brought into view; and being separated from one another, a considerable portion of the thyroid gland is in this manner laid bare. As this gland is plentifully supplied with blood-vessels, and as a division of any of these proves very troublesome, and on some occasions even dangerous, some attention is necessary to guard against it. This, however, may commonly be easily done, by avoiding the inferior portion of the gland where the two lobes of which it is composed unite, and finishing the operation

ration at the upper part of it where they separate. In order, too, to guard as much as possible against the inconvenience which arises from the division of the arteries of this gland, the incision ought to be done very slowly; for, on some occasions, they are of such a magnitude as to be perceptible to the naked eye before being cut, and in such instances they may always be avoided.

The cellular substance lying between these portions of the gland being cautiously removed, the trachea is thus laid bare; and if no large blood-vessel has been divided, the operation may be immediately finished, by making an opening between any two of the cartilages. But if any large artery has been cut, it must be secured with a ligature before going further. Authors differ much in their opinion respecting the best manner of finishing this part of the operation. By some it is recommended to make an opening with a scalpel, while others prefer for this purpose the point of a lancet; and by all, the perforation is
advised

advised to be of such a size as to receive a tube or canula of silver, through which a quantity of air may be transmitted fully sufficient for the purpose of respiration. But as much mischief occurs from blood getting into the trachea, by the convulsive cough which it induces; and as this can scarcely be prevented in the usual manner of performing the operation, it has been proposed to employ a cutting instrument adapted to a canula of a proper size for being left in the opening. Descriptions of instruments for this purpose may be met with in the works of the ingenious Doctor Richter of Gottingen*, which we have already referred to, and in the fourth volume of the Memoirs of the Royal Academy of Surgery of Paris by Mr Bauchot.

An instrument which I consider as an improvement upon these, is delineated in Plate XXIII. fig. 2. It is nearly of the form of a flat trocar, but not quite so long. The patient's head being still supported and

somewhat

* *Vide* Augusti Gottlieb. Richteri D. Medicinæ Professoris Gottingensis observ. chirurg. Fascicul. secund. cap. iii.—Gottingæ 1776.

somewhat drawn back, the point of the stilette must be made to penetrate the membrane between two of the cartilages; and the extremity of the canula being pushed fairly into the trachea, the stilette is to be withdrawn, and the canula afterwards secured by a piece of tape connected with it, being tied on the back of the neck.

The instrument is here represented without incumbrances from the dressings; but before it is introduced, it should be passed through the centre of three or four thin linen compresses; which not only serve to cover the pledgit of emollient ointment with which the wound should be protected after the stilette is withdrawn, but by withdrawing one or more of these pieces of linen, which may be easily done without moving the instrument, merely by cutting up their sides with a pair of scissors, the length of the canula may thus be augmented at pleasure; and which, in the event of any swelling occurring about the wound, is found to be a very important precaution: For unless it be attended to, a
very

very flight tumefaction on the sides of the fore will throw the canula entirely out. The canula should therefore be always of such a length as may obviate any inconvenience which might otherwise occur from this accession of swelling. For this purpose, it should never be less than two inches long: When it is first introduced, just as much of its extremity should be left uncovered by the compresses as admits of its passing easily into the trachea. If any swelling occurs, one, two, or more plies of the linen being cut off, will still admit of the canula penetrating to the same depth; and, on the contrary, when it happens that the parts are somewhat tumefied at the time of the operation, as the quantity of tube lodged in the trachea might be too much increased by the swelling subsiding, the inconvenience which would otherwise ensue may be easily prevented, by a few additional plies of linen being inserted between any two of the compresses.

By experience we learn, that a double canula answers better in this operation than

a single one. When one tube only is used, it is apt to fill with mucus; and as it must frequently be taken out for the removal of this, respiration is in the mean time apt to be interrupted: But when a double tube is employed, the inner canula can be easily removed, cleaned, and replaced; while every inconvenience that would otherwise result from it is prevented by the other being left in the opening. When, therefore, the outer canula of the tube is properly fixed, the other having been previously adapted to it, should be immediately pushed into it; and the opening in the canula being covered with a piece of crape or fine muslin, to prevent the admission of dust, &c. the operation is thus completed.

As the intention of this operation is to obviate the inconveniences arising from an obstructed respiration, it is evident that the canula should be continued in the wound as long as the cause exists which gave rise to it. If a piece of bone or any other substance has passed into the trachea,
and

and if this cannot be extracted at the opening newly made, a curved probe should be introduced at it, in order to ascertain the situation of the extraneous body ; and this being done, another perforation directly above it becomes absolutely necessary. By this means, this cause of the disorder may, in some instances, be removed, and when obstructions of a different kind are found to have produced it, the means best adapted for their removal should be immediately employed. But till this is completely accomplished, the canula must be continued : And when at last it is thought proper to withdraw it, the skin should be immediately drawn over the orifice, and retained there by a piece of adhesive plaster, by which means a cure of the sore will soon be obtained.

Dr Richter, among other improvements upon this operation, advises the canula to be curved ; but, in the different instances in which I have had occasion to perform this operation, none of the inconveniences occurred which the Doctor supposes may
proceed



Plate XXIII.

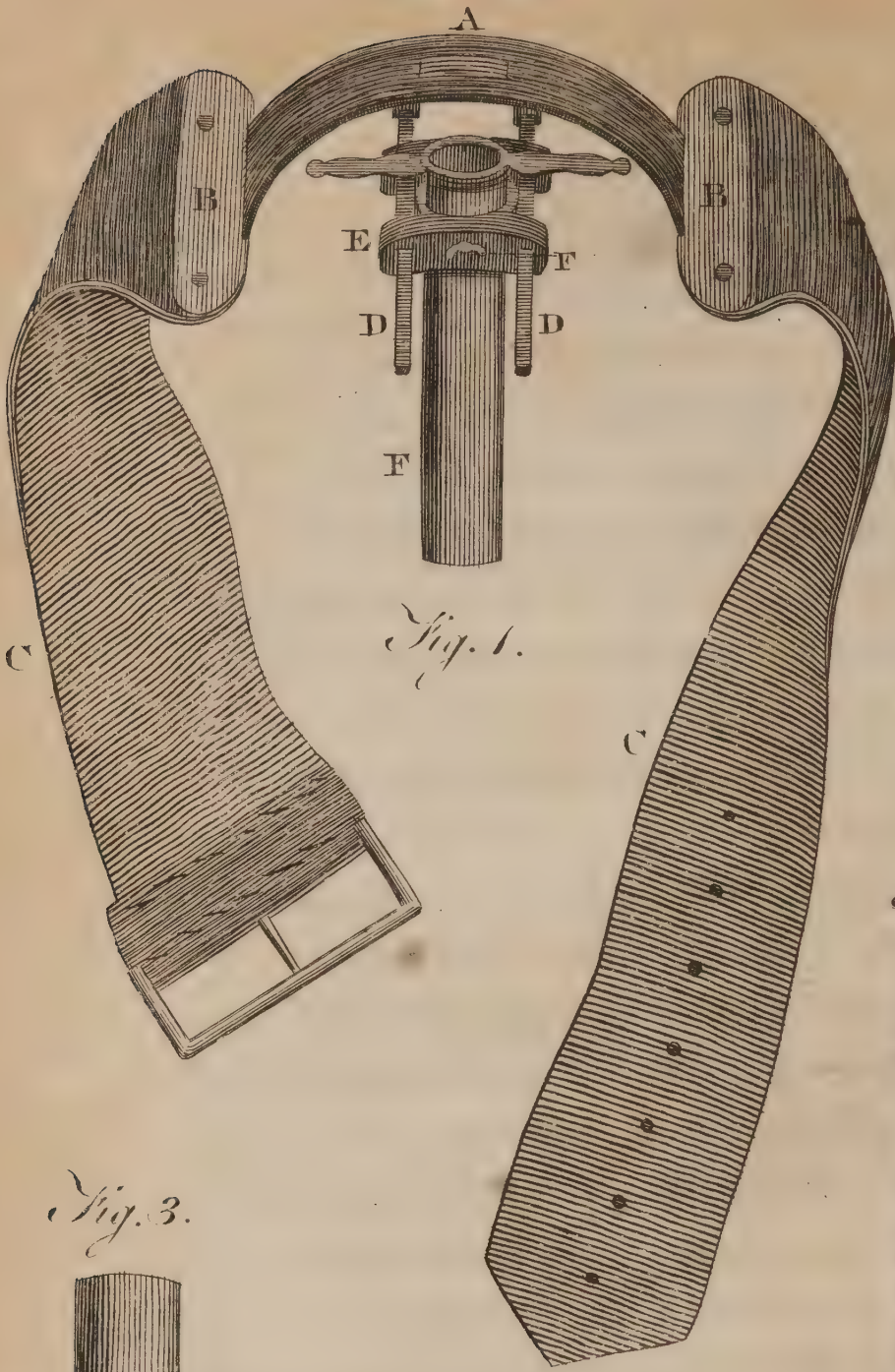


Fig. 2



Fig. 3.



A. Bell Sculp.

proceed from employing a straight one: On the contrary, I have found the straight canula answer every purpose; and as a tube much curved cannot have another exactly fitted to it to be occasionally inserted and withdrawn, this I think is a sufficient reason for not adopting the curved canula which Dr Richter proposes.

To such as have not had opportunities of performing this operation, the attention we have desired to a proper regulation of the length of the canula may appear to be unnecessary. This, however, is far from being the case; and much embarrassment would ensue from negligence on this point. The means we have recommended for this purpose are simple, are at all times easily procured, and, upon trial, they have been found to answer. But a very neat and ingenious contrivance for the same intention has long been exhibited by Dr Monro in his course of surgery; and of which he has been so obliging as to admit of a delineation being here given. It is represented in Plate XXIII. fig. 1.

C H A P. XXIV.

Of Oesophagotomy.

SUBSTANCES are frequently taken into the pharynx, which, in passing into the œsophagus, are found to be too bulky to be forced down to the stomach by the muscular exertion of the parts at which they stop. When any part of such substances can be observed on looking into the pharynx, they are in general easily removed with a pair of forceps: But when they have passed entirely out of the pharynx, and are lodged in the œsophagus, no advantage can be derived from this; and

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Fig. 1.



Fig. 2.

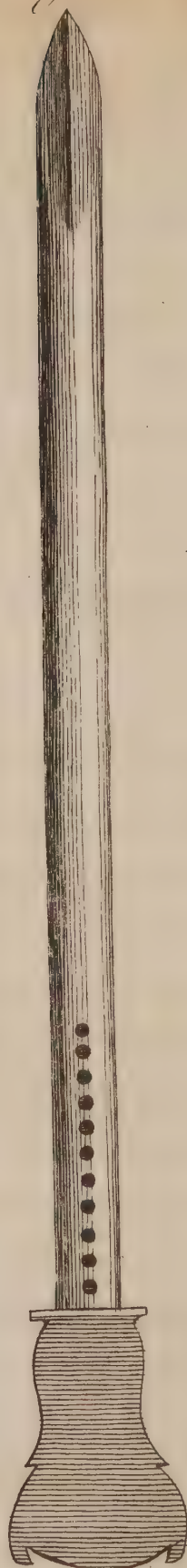


Fig. 3.



we are in such circumstances reduced to the necessity either of allowing the substance to remain where it is fixed ; of pushing it into the stomach ; or of extracting it by laying the œsophagus open.

When the substance resting in the œsophagus is of a soft texture, such as bread, cheese, or even flesh, the easiest and most prudent method of getting free of it is, to push it into the stomach by an instrument termed a Probang, Plate XXIV. fig. 1. This is much safer and easier than to attempt to bring it up, as is frequently recommended, by a strong vomit ; for if this should not succeed, the exertion of vomiting in this obstructed state of the œsophagus would be very apt to do mischief.

But when a pin, a piece of sharp bone, or any other firm substance, is fixed in the passage, we should by no means attempt to push it down ; for, by doing so, if it does not go into the stomach, any point or roughness with which it is furnished, may be pushed directly into the substance of the œsophagus.

I think it necessary to observe, that this is a point of importance, and ought therefore to meet with attention. In every case of obstruction of the œsophagus, proceeding from some foreign body being fixed in it, it is almost the universal practice to endeavour to push it into the stomach. When the obstructing substance is of a soft yielding nature, this may commonly be done with safety; but for the reason we have mentioned, it will very frequently do mischief when it is of a hard texture. In every case, therefore, of this kind, if the pain produced by the obstruction be not great; if the breathing is not materially affected; and if the passage is still so pervious as to admit of the necessary food and drink going down to the stomach, no attempt should be made for removing it; for we know from experience, that, in most instances, every thing of this kind is at last carried down, either, by some degree of dissolution taking place in the substance itself, or by some partial suppuration forming in the œsophagus,

phagus, by which that part of the extraneous body which was fixed in it is effectually loosened.

But where the obstruction of the œsophagus happens to be so complete as to prevent the passage of nourishment into the stomach, or when breathing is much interrupted by it, if it be not found practicable to remove the obstructing cause by other means, it comes to be a question whether any attempt should be made for taking it out by an incision. As the œsophagus lies deep, being covered with the trachea, and as different blood-vessels of some magnitude lie contiguous to it, it has always been very justly considered as dangerous to make an incision into it; and in general it has been laid down as an established maxim never to attempt it.

But altho' no practitioner would think it advisable to perform this operation without some reason of importance, yet in such instances as those we allude to, where much danger must ensue from any material interruption being formed either to

the passage of food into the stomach, or of air into the lungs, it would surely be preferable to give the patient a chance even from this doubtful remedy, than to allow him to meet a certain and miserable death.

Notwithstanding a very general prejudice which prevails against this operation, I think we are sufficiently warranted in recommending it in those cases of obstructions in the *œsophagus* that cannot be otherwise removed ; and our opinion is founded on the following circumstances : Wounds in the *œsophagus*, whether inflicted by accident or design, have been frequently cured, different instances of which have fallen within my own knowledge ; and of which the most remarkable was the case of a man who, in an attempt to destroy himself, cut the trachea on the right side completely through, and likewise penetrated the *œsophagus* ; and among other instances recorded by authors of wounds in the *œsophagus* being cured, one is mentioned by Bohnius ; in which, from the food passing freely out at the wound,

wound, it was evident that the œsophagus was injured, and yet a cure was easily accomplished.

By various experiments this operation is found to be safely practicable on dogs and other animals, in which the structure of the parts concerned is nearly the same as that of the human body : It has been repeatedly done on the dead subject, without any injury to the contiguous large blood-vessels : And, lastly, there are at least two instances upon record, of its having been performed with safety and success on living subjects *. We have therefore no hesitation in saying, that cases may occur in which it may be proper to cut into the œsophagus.

Besides those obstructions arising from the causes we have mentioned, many instances have occurred in practice of the œsophagus being so completely stopped up by constrictions and tumors, as to prevent all communication between the mouth and the stomach.

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* Vide Memoires de l'Academie Royale de Chirurgie, tom. iii. p. 14. Paris, 1756.

When these are situated in the superior part of the œsophagus, making an opening into it may be sometimes advisable, with a view to the conveyance of nourishment into the stomach: Any advantage, however, to be expected in such cases from the operation, will in general prove merely temporary, as diseases of this nature have hitherto resisted every attempt that has been made for removing them.

By many anatomists the œsophagus is represented as lying evidently to the left side: If it does stretch to the left, it is in a very inconsiderable degree; but this consideration may render it proper to prefer the left side for this operation; the method of performing which is this: The patient being secured in the manner we have desired for bronchotomy, and his head drawn back and kept firm by an assistant, an incision should be made with a scalpel, at least two inches in length, directly thro' the skin and cellular substance, keeping close by the side of the trachea, and commencing about half an inch above the part where the obstructing substance is fixed when
this

this can be done ; and where this is found to be impracticable by the obstruction being within the cavity of the chest, the incision should commence about an inch and half above the breast-bone.

The cellular substance being freely divided, the sterno-thyroidæi and sterno-hyoidæi muscles, together with a portion of the thyroid gland, will be brought into view : By a flat blunt hook, one assistant should pull the muscles gently to the left side, while another by the same means pulls the trachea somewhat to the right, so as to admit of the œsophagus being brought into view. If any large blood-vessel is unavoidably divided, it should now be secured with a ligature ; and this being done, the operator is to proceed to open the œsophagus. When the piece of bone or other substance fixed in the passage is discovered by the finger, the perforation ought to be made directly upon it ; and the cut, which ought always to be longitudinal, being made of a sufficient size for extracting it, this should be immediately done

with a pair of small forceps. But when the cause of obstruction is found to lie within the cavity of the chest, a circumstance which will no doubt add to the hazard of the operation, the œsophagus ought in this case to be opened immediately above its entrance into the chest; care being taken, in order to give sufficient room for what is to follow, that the opening in the œsophagus be extended upwards, to the full height of the external incision. This being done, a large firm probe should be introduced, in order to determine the seat of the obstruction, when by means either of a pair of straight forceps when it is found to be near at hand, or of crooked forceps when more deeply seated, the substance producing the mischief should be laid hold of, and cautiously extracted.

The operation being now finished, all our attention is to be given to the treatment of the sore, and nourishment of the patient. When the operation has been performed for some disease in the superior
part

part of the œsophagus, till this is either removed by medicines, or by an operation, which in cases of compression from tumors may sometimes be done, our principal object is the conveyance of nourishment to the stomach: In such instances, there is a necessity for preserving the opening in the œsophagus. But when the operation has been performed for the purpose of removing a foreign substance fixed in the passage, as soon as this is accomplished, nothing should be omitted that can tend to produce an immediate reunion of the divided parts. If, in such circumstances, the patient be allowed either to eat or drink much, the opening in the œsophagus will be found difficult to heal, and may become fistulous. It will therefore be more prudent to recommend a total abstinence from solid food for several days, and to convey nourishment by injecting strong broths by the anus, and allowing very small quantities of milk or soup to be now and then swallowed: By this means, by preventing the patient from moving his neck, and by
treating

treating the wound in the same manner with similar affections in other parts, we know from experience, that a cure may at last be expected ; and at any rate, if the contrary should happen, and if the wound should remain fistulous, or even if death should succeed, still the operator will have the consolation of having attempted every probable means for the safety of his patient. In addition to what we have already said of the propriety of this operation in particular cases, we may remark, that the danger attending it is by no means so great as is commonly imagined. If the incision be made as we have directed, close by the side of the trachea, no injury can be done to any of the larger arteries or veins : The only arteries we have to be aware of, are those branches of the laryngeal artery which supply the thyroid gland. By proper caution, the principal arteries of the gland may be in general avoided ; but if they should happen to be divided, they may commonly be secured with ligatures, especially if the external incision be sufficiently

ciently free. By proceeding with caution, too, that branch of the eighth pair of nerves, which from its inverted direction has been termed the Recurrent Nerve, and which runs close by the side of the œsophagus, may be generally avoided; and even in the event of some branches of it being divided, all the bad consequences that would probably ensue, would be some degree of weakness in the voice; for the muscles of the larynx, in which they are chiefly spent, do not depend entirely upon them.

C H A P.

C H A P. XXV.

Of the Amputation of Cancerous Mammæ.

CANCERS have been known to attack almost every part of the body ; but they are more frequently met with in the breasts of women than in other parts.

In a former publication, we entered into a full consideration of the subject of cancer : We are now, therefore, to refer to that work for the description and diagnosis, as well as for the medical treatment of the disease ; and in this chapter, we are only to relate the removal of cancerous tumors of the mammæ by amputation *.

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* The publication we here allude to is, a Treatise on the Theory and Management of Ulcers, &c. Part II. Sect. viii.

A real cancer is perhaps the most formidable disease to which the human body is liable : Wherever it may be situated, its consequences are to be dreaded ; but more especially when seated on the *mammæ*. Various causes have been assigned for cancerous affections proving more malignant in this situation than in others : But the obvious reason of it is, that the breast, being entirely glandular, is more liable to cancers of an extensive size than other parts ; by which means, the blood is more liable to be infected by absorption, as a greater number of absorbents necessarily serve to convey matter from the surface of a large sore, than from one of a smaller extent.

We have elsewhere shown, that cancer, on its first appearance, is perhaps, in every instance, a local affection only ; that the cancerous diathesis is produced, not by any original affection in the constitution, but by absorption from a local ulcer ; and hence we concluded, that every cancerous sore should be removed by immediate amputation, wherever this can be practised.

This,

This, we think, ought to be an established maxim in the treatment of all cases of cancer wherever they are situated; but from their being, as we have said, more apt to infect the general system, when seated on the mammæ, than on other parts of the body, this is an additional reason for early amputation in every cancerous affection of the breast.

As every scirrhus gland in this part is apt to degenerate into a real cancer, and as indurations of this nature have hitherto resisted the effects of every other remedy, we should on every occasion advise their removal by early amputation: This, we know, is a point with respect to which practitioners are not universally agreed; as it is alleged by some, that scirrhus glands in the mammæ have been known to remain in an indolent, inoffensive state for a great length of time; and therefore, that their removal ought never to be attempted till they have actually proceeded to a state of ulceration.

But this opinion, which is evidently
founded

founded in timidity, has been the cause of much unnecessary distress to such individuals as have followed it; and has brought the operation of amputating cancerous breasts into a degree of general discredit, which it does not merit. There is no fact of which I am more convinced, than that many more would recover by means of the operation, were it employed in a more early period of the disease, particularly while the glands are still in a scirrous state, and before any matter is formed in them; and as instances of their remaining in an indolent state for any considerable length of time are very rare, no dependence should be placed on their doing so. —It is not a single instance or two, on which, in matters of this kind, an opinion ought to be formed: It is the result of general observation which ought to direct us; and every unbiassed practitioner must confess, that what we have here asserted respecting this matter is, at least in general, well-founded.

The propriety of early amputation of
scirrous

schirrous breasts being admitted, and the practice established, it may possibly happen in a few instances, that schirrous tumors of this part may be removed, which might have remained in an indolent state for some time longer. But as this will not frequently happen; as we have no means by which we can judge with certainty, between such cases as might remain for some time in this indolent state, and those the progress of which would prove more rapid; and especially, as the advantages derived from early amputation are unquestionably great; no hesitation should occur in putting it universally in practice.

When practitioners, therefore, have an opportunity of amputating cancerous or schirrous breasts early, they ought always to embrace it. It often happens, however, from an improper delicacy in patients, as well as from other causes, that practitioners are not consulted till the disease is far advanced. But although the advantages to be derived from the operation will in general

neral be in proportion to the previous duration of the disease; yet on all occasions, even in very advanced stages of cancers, it is right to advise it, provided the parts affected can be completely removed. When, indeed, this cannot be effected, from the cancerous parts lying too deep, or from their being immediately connected with organs essentially necessary to life, by which amputation of the one cannot be performed without considerable injury being done to the other; in such circumstances, as the operation would not be of any real utility, it should not be recommended: For, as all the diseased parts could not with propriety be removed, and as the cancerous virus is of a very assimilating nature, it would answer no beneficial purpose to amputate only a portion of them. But in every instance where the parts affected can be safely separated from the sound, as nothing but their removal can afford any chance of safety, we must again say, that no hesitation should occur in advising the operation. We shall now

proceed to describe the method of performing it.

In every surgical operation it should be an established maxim to save as much skin as possible. Such portions of the common teguments as are diseased, or that adhere firmly to the parts below, ought by all means to be taken away; but it can never be proper to remove more than this: For it is now universally known, that the cutis vera is never regenerated; and when destroyed, that the parts underneath are afterwards covered by a thin scarf-skin only. This, however, is not the only objection to an extensive removal of skin: In every operation where much of it is destroyed, the wound which remains is necessarily much more extensive, and a cure is therefore much more tedious in effecting, than when little, or perhaps no skin has been taken away. Indeed, this is so much the case, that in operations where no skin has been removed, cures will be sometimes accomplished in a few days, which, by the removal of much
skin

skin in the usual way of performing the same operation, would be protracted to a great number of weeks.

This practice of removing much skin in the amputation of tumors, seems to have originated from an idea which has long and very universally prevailed, that the skin by much distention is apt to lose its tone so entirely as not to be able to recover it again; and therefore that in every such instance, a considerable part of it ought to be taken away. This, however, is by no means the case; and whoever will adopt a contrary practice, will find, that it rarely if ever happens, that a tumor becomes so extensive as to destroy the elasticity of the skin which surrounds it.—Inflammatory tumors indeed proceed frequently with such rapidity to a considerable bulk, as to distend the skin more quickly than it can properly bear, and at last very commonly terminate in a complete rupture of it.—But in almost every other variety of tumor, the progress of the swelling is so extremely slow and gradual, that the na-

tural contractile power of the skin is seldom or never so far destroyed by it, as to prevent it from recovering its tone on the cause producing the distention being removed: And in cases of scirrhus breasts, this contractile power of the skin is commonly so remarkable, that even when the breast is much enlarged, and when all the glandular part of it is removed, the skin, if it has been preserved, almost constantly contracts to the size of the remaining fore; so that in every case of this nature, none of the skin should be removed that is not either actually diseased, or adhering so firmly to the parts below, that it cannot be separated from them.

In proceeding to the operation, the patient must be either firmly seated in an arm-chair, her head being supported with a pillow by an assistant behind, whilst her arms are properly secured by an assistant on each side; or when no objection is made to it by the patient, no position answers so well as placing her upon a table: In this manner, she is more easily secured; faintings are

are less apt to occur ; and the surgeon proceeds with more ease through every part of the operation, than when she is seated in a chair. But in whatever position the patient may be placed, the surgeon should for certain be seated : Surgeons, indeed, perform this operation most frequently while standing before the patient ; but no operator will ever attempt it in this manner, who has once experienced the advantages which result from doing it as we have directed.

In the first place, we shall suppose the operation to be performed for a schirrous affection of the mamma, while the skin is still perfectly sound, and without any firm adhesion to the parts underneath. In these circumstances, an incision should be made with a scalpel through the skin and cellular substance, from one extremity of the tumor to the other ; taking care to direct the scalpel so as that it may avoid the nipple, by carrying it an inch or so to one side of it. When the disease has extended, as it sometimes does, beyond the mamma towards the sternum, as this com-

monly throws the longest diameter of the tumor across the body, it is necessary that this external incision run in a direction corresponding to the length of the tumor, by making it to commence at one side of the mamma, and to terminate at the other. But when the mamma alone is diseased, the external incision should run in a perpendicular direction, commencing at the most superior part of the tumor, and finishing at the most depending point of it. By this means any matter which may form during the cure is freely discharged; which is not the case when the incision runs in a transverse direction, unless the inferior portion of the teguments be afterwards divided from above downwards; which, in such cases, should always be done: For although, in some instances, a cure is easily obtained, even when this precaution is not attended to, yet in general some inconvenience would be experienced from the neglect of it.

The skin and cellular substance being thus freely divided, they should now be
separated

separated from the diseased parts below by a slow and steady dissection; and as soon as this is accomplished, the teguments should be kept asunder by assistants, till all the glandular part of the breast is dissected from the pectoral muscle and other parts with which they are connected. With a view to preserve the pectoral muscle as much as possible from being cut by the scalpel, the arm of the affected side should be kept extended somewhat above a horizontal direction; by which means all the fibres of this muscle are preserved in a state of extension, and are thus less liable to be injured during the operation than when they are allowed to be much relaxed.

It often happens, indeed, that the diseased parts adhere to the pectoral muscle; and, on some occasions, although it was not previously suspected, even the periosseum of the ribs is found to be affected. In such instances, as there is a necessity for all the diseased parts being removed, no hesitation should be made in

using every proper freedom with the pectoral muscle, as well as with any other part to which the mamma adheres ; but whenever the removal of the parts affected can be accomplished without any violence to these parts, it ought by all means to be done.

On the mamma being entirely separated, the operator should examine with much accuracy, not only the surface of the fore, but the parts beneath the edges of the divided skin ; and if any indurated glands are discovered, they should all be removed. We ought to be particularly guarded and attentive in this part of the operation ; for unless all the diseased glands be removed, no advantage whatever will be derived from it.

We have desired that the whole glandular part of the mamma be removed. Even where a small portion of it only is diseased, the whole of it should be amputated : For no good purpose can be answered by a portion of it being left ; and in many instances some detriment ensues
from

from it by the disease breaking out again in some part of the remaining glands. When indeed it is found that a single loose gland only is affected, this may be taken out without any detriment to the rest of the breast; but whenever the disease is in any degree extensive, the whole mamma should be removed.

The next step in the operation is to secure the divided arteries, which should always be done with the tenaculum. As the arteries of the mamma are frequently small and numerous, much attention is necessary to discover them. All the coagulated blood should be effectually cleared away by a sponge and warm water; and if the patient is faint, a glass of wine or some other cordial should be exhibited; by which means it often happens, that small branches of arteries are discovered which otherwise would have escaped notice, and which afterwards might have been productive of much hazard and inconvenience.

The blood-vessels being thus secured,
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and the surface of the fore cleared of blood, the divided teguments must now be brought together; and, in order to secure them exactly in their situation, ligatures should be introduced at those points where the operator sees that they will answer the purpose most effectually. I have sometimes employed slips of adhesive plaster for this purpose; but nothing retains the parts so properly in their situation as ligatures; and the pain with which they are attended is too trifling to be mentioned.

In securing the teguments in the manner we have directed, care must be taken to leave all the ligatures of the arteries hanging an inch or two out from the wound, so that they may be withdrawn at the end of three or four days; which in general may be easily and safely done when they have been applied with the tenaculum.

In order to promote the adhesion of the teguments to the parts underneath, a moderate and equal degree of pressure should be applied over the whole by means of the napkin and scapulary bandage; but before

fore applying it, the parts should be all covered with a piece of soft lint spread with any emollient ointment, and over this there should be a thick compress either of lint, tow, or soft old linen.

In this manner, when no portion of the teguments has been removed, as the whole fore will be covered with skin, a cure will be obtained by a process which surgeons in general have termed “the first intention;” that is, without the formation of matter, merely by the adhesion of the teguments to the subjacent muscles.

But it does not often happen that the operation is advised whilst this very favourable mode of practising it is admissible. In general, before a practitioner recommends amputation of a breast, and almost always before a patient consents to it, a considerable portion of the external teguments are so much diseased, as to render it necessary to remove them along with the glandular part of the mamma; or, if the skin be not actually diseased, it commonly adheres so much to the most prominent

minent part of the breast, that it cannot be separated from it. In either of these events, some portion of the skin must be removed along with the mamma; and the easiest method of doing it is this: A longitudinal incision should be made, in the manner we have directed, through such parts of the teguments as are perfectly sound, whilst that portion of the skin which is in any degree diseased, or which adheres firmly to the glandular part of the breast, should be separated from the sound skin, by a circular or oblong incision, with which the longitudinal cut ought to communicate; and this being done, the operation is to be finished in the manner we have pointed out, by dissecting off every part that is indurated, along with that portion of the skin that has been surrounded, by an incision such as we have mentioned.

In the after state of the sore, a material difference takes place between the operation we have now described, and that in which no necessity occurs for removing
any

any portion of the skin. Where none of the skin is removed, the divided teguments on being drawn together cover the fore completely; an adhesion commonly takes place over the whole; and the cicatrix which ensues is very inconsiderable: But when any portion of skin is removed, a fore is always left, which not only renders the cure tedious in proportion to the quantity of skin taken away, but the remaining cicatrix is necessarily of the same size; by which a tenderness is left in the site of the disease, which I am convinced has often some influence in giving rise to a return of it.

The fore which remains after the operation we have last described, ought to be treated with the very mildest dressings. If any hemorrhagy occurs from the surface of the fore immediately after the operation, which is not removed by the ligatures applied upon the larger arteries, dry lint is for the first dressing, the best application; but for all the after-dressings, lint covered with any emollient ointment should

should be preferred to every other remedy. An application of this kind never creates any pain, which dry lint very commonly occasions; and it admits of a more quick formation of granulations than any dressings of an irritating nature.

We have hitherto been supposing that the disease occupies the mamma only; but it often happens, that the lymphatics leading from the breast to the armpit are much indurated, and that the glands in the armpit itself are both indurated and enlarged. In some instances, too, a number of diseased glands are found to run from the breast to the clavicle, and to spread in considerable clusters along the under edge of that bone.

In such circumstances, the amputation of the mamma itself must be managed in the manner we have already advised; but besides this, an incision through the skin and cellular substance should be made to run from the farther extremity of every portion of hardened glands, and to terminate in the principal sore produced by the removal

removal of the mamma. Thus, when the glands in the armpit are affected, although they might frequently be pulled out by a hook insinuated below the sound skin at the fore in the breast, and made to penetrate one or more of the glands to be removed; yet it answers the purpose better in every respect, to lay the glands first bare by an incision in the manner we have directed, and then to dissect them cautiously out with the scalpel. In the course of the dissection, a good deal of assistance may be obtained from passing a strong ligature thro' the largest of the glands; by which the whole cluster with which it is connected may be considerably detached from the parts below, so as to admit of their being more easily cut out with the scalpel: And in many instances these indurated glands run so near to the axillary artery, as to render it highly proper to use every probable means for rendering the dissection safe and easy.

In like manner, when a cluster of diseased glands is found to extend towards
the

the clavicle, or in any other direction, after the teguments have been freely divided, the glands themselves should be totally removed; and both here and in similar affections in the armpit, the divided teguments should be brought together, and retained in their situation, either by compression alone, or, when this does not appear to be sufficient for the purpose, by the introduction of one or more futures or ligatures.

The point which we wish to inculcate most particularly respecting this operation is, the propriety of saving as much skin as possible. The necessity of this had rarely, if ever, occurred to our forefathers: And accordingly the common practice has been, to remove all the skin corresponding to the morbid parts underneath: By which much unnecessary pain is produced; a very extensive and very ugly sore occurs; and a cure is always very tedious in being accomplished. Instead of which, by the means we have recommended, although it will not often happen that the
fore

fore can be entirely covered with skin ; yet, on every occasion, a considerable part of it may for certain receive this very material advantage, by which the extent of the fore will be always much diminished ; a cure will be proportionally more quickly effected ; and by the cicatrix being less extensive, the risk of the patient suffering from future injuries will also be less.

The propriety of saving as much skin as possible, not only in this operation, but in every other where an extensive fore is commonly left, particularly in amputation of the extremities, has always appeared to me to be a matter of such importance, that, from the time of my entering on the operative part of business, I have taken every opportunity of putting it in practice. Ever since the year 1772, I have managed cancerous breasts in the manner I have now mentioned, that is, by endeavouring to save as much skin as possible ; and the advantages derived from it have been very considerable.

Till of late, the only means put in prac-

tice for securing the skin in its situation, so as to effect an adhesion between it and the parts underneath, was compression by the napkin and scapulary bandage, excepting in a few cases in which adhesive plasters were employed. But as ligatures give very little pain, and as they retain the parts more certainly in their situation than any other means, I now employ two, three, or more, according to the extent of the divided parts; and they always answer the purpose completely.

In the amputation of limbs, where it is evidently of much importance to have the remaining sores as completely covered with skin as possible, I have, during the above-mentioned period, taken every opportunity of performing the operation in such a manner as has accomplished this very effectually. Within these few years Mr Allanson of Liverpool, to whom the public is much indebted for the pains he has taken to improve this operation, has proposed another method of effecting this, by which the stumps may indeed be sufficiently covered;

covered ; but objections occur to this mode of operating, which do not apply to the operation which I now allude to. These, however, we shall have an opportunity of considering more particularly in a subsequent part of this work ; and shall now shortly observe, that the most exceptionable part of Mr Allanson's operation seems to be, the removal of a portion of muscular substance at the extremity of the stump, by which the bone is not so effectually covered as when the whole is allowed to remain, and by which the matter which is formed in the course of the cure is apt to lodge in the hollow produced by this excavation of the muscles ; at least this has been the result of our trial of this operation in the Royal Infirmary here ; and, for the reason we have just mentioned, namely a hollow being formed towards the extremity of the stump, this, it is probable, will not be an uncommon consequence of this operation.

These observations on the amputation of limbs are rather out of place ; but as

they naturally arise from the subject I have been treating ; as the practice to which they relate is at present a frequent subject of medical conversation ; and as the chapter in which they ought to appear will not have a place in this volume ; I flatter myself I shall stand excused for having slightly touched upon them here.

E R R A T A.

PAGE 34. line 8. For *Plate I.* read *Plate XII.*

119. line 10. For *Plate XVIII.* read *Plate XVII.*

EXPLA-

EXPLANATION of the PLATES.

PLATE XII.

[Opposite to page 34.]

Fig. 1. Represents a common staff for the purpose of founding.

Fig. 2. A grooved staff for the operation of lithotomy, with the groove on one side. This improvement was suggested for the purpose of passing the gorget more easily into the bladder than when the groove is on the convex part of the instrument : But the usual form of the staff is found to conduct the gorget with much ease ; so that this alteration of it has not been generally adopted.

Fig. 3. A common staff of the usual form, with the groove on the convex part of it.

The curvature we have here given to

G g 3

the

the staff has by experience been found to be more proper than any other: There is no necessity for that degree of convexity which is generally given to it; the form here represented is introduced with more ease; and it does not injure the urethra, which those with a greater degree of curvature always do.

A staff for a full-grown male subject should be twelve inches long, besides the handle; and for children of seven years and under, they should be from seven to nine inches long.

PLATE XIII.

[Opposite to page 98.]

Fig. 1. A side-view of the cutting director described in page 98. This instrument is here represented of a full size for the largest adult, viz. five inches from *A* to *B*, and three inches from *B* to *C*.

Fig. 2. Represents a front-view of the same instrument.

Fig. 3. Affords a back-view of it; and fig. 4. a transverse section of it.

This director, in the grooved part of it, should

should be exactly three-eighths of an inch broad, viz. from *D* to *E* ; and the cutting part of it, from *F* to *G*, should measure nearly an inch. The beak of the instrument should be exactly fitted to the groove of the staff with which it is to be used.

In order to obtain a free passage for the stone, it has been proposed to increase the breadth of the cutting part of Mr Hawkins's gorget to a great extent: By some, it has even been said that a couple of inches may be added to it. This, however, proceeds from inattention to the anatomy of the parts concerned in the operation; for that part of the urethra through which the gorget passes to the bladder, is so much confined by the contiguous bones, that it is absolutely impossible to introduce a gorget of this size into it in a proper direction. The prostate gland ought, in the operation of lithotomy, to be divided in a horizontal lateral direction. Now, this cannot be done by an instrument of the breadth we have mentioned. But, even although it were easily practicable, there is no neces-

fity for such an extensive wound as this instrument would make. We have formerly said, that nothing should be left for the director or gorget to divide but the prostate gland, together with a very small portion of the neck of the bladder; and as an instrument such as we have here delineated effects this in the most complete manner, there is no necessity whatever for one of a greater breadth.

The back part of the cutting director being considerably narrower than the common gorget, it ought to be made of a sufficient thickness, in order to overcome any resistance it may meet with in passing into the bladder. The transverse section, fig. 4. shows the strength of it.

For children from three to seven years of age, this instrument should not exceed three inches in length; and one of four inches will answer for every age above this to the twentieth year.

The cutting edge of this director, as well as the cutting part of the gorget in Plate XIV. is here represented upon the right
side

side of the instrument, by which the wound in the operation of lithotomy is made in the left side of the patient: But for a surgeon who operates with his left-hand this must be reversed, so as to have the cut made in the right side of the perinæum.

As this director has never been before mentioned to the public, I have given a more particular description of it than would otherwise be necessary.

PLATE XIV.

[Opposite to page 102.]

Fig. 1. The cutting gorget of Mr Hawkins, with the edge of it made to expand more than the usual form of it, by which it divides the prostate gland more freely.

The figure is of full size for the largest adults: From *A* to *B* should measure five inches and a half, and from *B* to *C* nearly three inches. This instrument at the widest part of it measures one inch, and contracts in a gradual manner to the point: The beak should be exactly adapted to the grooves of the staffs with which it is used; and should be turned a little forward, instead

stead of being perfectly straight or turned back as is sometimes the case: By this means it is carried with more steadiness along the groove of the staff than can otherwise be done. In page 97, we have mentioned at full length the objections which occur to the use of the gorget, and the reasons which induce us to consider the cutting director in Plate XIII. as a preferable instrument.

Fig. 2. A female catheter. This instrument is represented straight, as being more easily introduced when of this form than when much crooked: A sound for females, however, should have a small curvature, as being better adapted for discovering a stone in the bladder than a straight staff. A grooved staff of this form is represented in fig. 3.

PLATE XV.

[Opposite to page 104.]

Fig. 1. Is an improvement of the gorget by Dr Monro. It consists of a common gorget *AB*, with a blunt gorget *CD* fitted to it: The
nail

nail *E* fixed in the cutting gorget being made to pass through the slit in the blunt gorget *F*, the latter is thus made to run easily upon it. In using this instrument, the blunt gorget must be pulled back, so as to admit of all the cutting part of the other to project before it: And as soon as it has reached the bladder, the blunt gorget should be pushed forward; by which means the contiguous parts are effectually protected from farther injury, as the sides of the blunt gorget should be made considerably deeper so as to project over the cutting edges of the other.

This is an ingenious contrivance; and it will answer the purpose effectually, of protecting the surrounding parts while the instrument is withdrawing; a circumstance of much importance, and not always duly attended to.

Fig. 2. A male catheter of silver. The small holes near the extremity of this instrument answer better than a slit on each side of it, as with these it does not so readily become entangled with the urethra.

Catheters

Catheters have likewise been made of other materials, namely, of leather, and of flexible twine rolled into the form of a tube, and covered with bougie plaster; and of late a very neat invention of this kind has appeared, prepared of the *refina elastica*. These last are particularly recommended for remaining in the urethra in cases where bougies were formerly employed; but, from the trials we have made of them, they do not seem to answer when long inserted at once, as they turn soft and lose their elasticity entirely.

Fig. 3. An instrument I have named a Searcher, mentioned page 117.—In the operation of lithotomy it frequently happens that the stone is not readily felt with the forceps. When it is discovered by the other means we have advised, it may frequently be found by introducing this instrument at the wound: Which being of a considerable thickness, answers better for this purpose than a common sound; and when once the stone is discovered, the searcher ought to be preserved in close contact with it with one hand, while the
forceps

forceps is conducted to the stone by means of it with the other. In this manner, stones may be discovered, which otherwise might escape the ordinary means of searching.—This instrument should be made of steel, and should be nine or ten inches in length.

PLATE XVI.

[Opposite to page 106.]

Fig. 1. and 2. Forceps of different sizes for extracting stones from the bladder.—For a full grown adult they should be ten inches long and proportionally strong. Every operator ought to be furnished with three or four sizes from those of ten inches to such as are not more than seven. We have already desired, that the blades of the forceps may not meet when they are shut; for by doing so they would be apt to lay hold of the bladder; and for the same reason, their teeth ought not to be very long. If they have merely a roughness, it answers the purpose sufficiently of fixing the stone; and this is all the advantage to be derived from it. Even this roughness should be confined to within an inch of the
the

the point of the forceps ; for when it is made to reach nearer the joint, small stones are apt to fix in this part, and to dilate the blades of the instrument much more than otherwise it would do.

Fig. 3. Forceps with a small degree of curvature. When the forceps of the usual form do not easily lay hold of a stone, such as are somewhat crooked will sometimes meet with it : In general, however, the straight forceps answers all the purposes of the other ; and as stones, when laid hold of are always more easily extracted with the straight forceps, they should commonly be preferred.

PLATE XVII.

[Opposite to page 115.]

In the chapter on Lithotomy, we have taken different opportunities of mentioning the risk attending the extraction of a large stone ; and when a stone is found to be so very large as to give cause to suspect that it cannot be extracted but with much difficulty, we have given it as our opinion that it should rather be broken into different

rent

rent pieces: For this purpose various instruments have been proposed.—Fig. 1. represents forceps with long teeth, by which almost any stone may be broken.—By the screw and lever connected with it, a much greater force may indeed be employed than will commonly be necessary.—These forceps should be about twelve inches in length, and of a sufficient firmness in every part, particularly in the joint, for bearing any force that may be needed.

Fig. 2. A scoop for extracting such small pieces of stone as cannot be taken out with the common forceps.

Fig. 3. A silver canula for introducing into the wound after the operation of lithotomy, for compressing such arteries as lie too deep to be tied by ligatures. This tube should be of a flat form: For a full-grown adult, an inch broad and four inches in length; and before being introduced, it should be covered with several plies of soft old linen. There should be two holes in the brim of the instrument
for

for connecting it by means of two pieces of tape to a circular bandage round the body.

PLATE XVIII.

[Opposite to page 135.]

Fig. 1. and 2. Different views of Frere Cosme's instrument for the operation of lithotomy. Fig. 1. Represents the instrument shut; and fig. 2. gives a view of it open.—The handle *A* with which the nitches *B* are connected, being kept in the situation represented in fig. 1. by the spring *C* being fixed on one of the nitches, the knife is thus preserved shut. But when the spring *C* is pressed upon, so as to raise it out of the nitch, as the handle *A* is made to move upon a pivot, it may now be turned; and the projecting part of it *D* being turned fully round, if pressure be now applied to *E*, it will raise the knife *F*, with which it is connected, to the elevation here represented.—The point *G* should be made blunt and round, so as to run with ease and freedom in the groove of a staff. The length of this instrument, including the handle, should be ten inches.

The method of using it is as follows:

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All the previous steps of the operation being finished, and the urethra being cut in the manner we have directed, the beak of the instrument *C* is to be conveyed into the groove of the staff, and while shut is to be pushed into the bladder. The staff is now to be withdrawn; and pressure being applied to *E*, so as to elevate the knife *F*, it is now to be drawn out in such a direction as to divide the prostate gland laterally when the forceps may be either introduced by running them in upon the forefinger of the left hand, or upon a blunt gorget employed for the purpose.

Various instruments of this kind have been invented; but the one here delineated is the most simple, and in every respect, indeed, the best of any we have met with. As the operation is still performed with it in different parts of Europe, particularly in France, I think it right to give a representation of it, but not with a view to recommend it.—The objections which occur to it are these: Although by the form of the handle the blade or cutting part of

the instrument may be elevated to any necessary degree, yet this does not ensure the formation of a wound of a fixed and determined size. It has indeed been asserted by those who think favourably of this instrument, that a wound of any determined size may be made with it; but this is by no means the case; and whoever will give it a trial will find, that the wound produced by it varies in size in every two that are cut with it; and this, even with the blade at the same degree of elevation; for the cutting part of it is at such a distance from the handle, that it is impossible for a surgeon to withdraw it always with such steadiness as to cut uniformly in the same direction; and if in one case it is made to press in any degree more to one side than in another, the wound formed by it will not only be of a different size, but very different parts may be cut by it.

But the most material objection to this instrument is, that it is very apt to injure more of the bladder than ought to be cut. It is the prostate gland and a small portion
of

of the neck of the bladder only which should be divided by this knife; but as it is always necessary to insert the point of it far into the bladder before this can be done, the sides and even fundus of it are in this manner very apt to suffer.

The only advantage which this instrument is supposed to possess over the cutting gorget or director is, that being inserted shut, and withdrawn open, only one cut is made in the parts through which it is made to pass; whereas, it is alleged, that in the usual method of employing the gorget or director, one incision is formed by the introduction of the instrument, and another when it is withdrawn. But, by attending to the directions we have given in the chapter on Lithotomy, this inconvenience commonly attributed to the gorget, and consequently to the director, may be always avoided; and as these instruments form a more free cut than the lithotome cachée, and as they do not so readily injure any part of the bladder which ought

not to be cut, they should therefore be preferred.

Fig. 3. Forceps with a screw *H* passing through their handles. When a stone is properly fixed in the forceps, various inventions have been proposed for preserving them in the same state; but the one we have here represented is the best and the most simple of any that has been mentioned.

PLATE XIX.

[Opposite to page 167.]

Fig. 1. A jugum which answers the purpose of compressing the penis very completely, and it fits upon the parts without producing any pain or uneasiness. It consists of a piece of elastic steel lined with velvet or soft flannel. By means of the screw *A*, it can be made wide or strait at pleasure; and the cushion *B* being placed upon the urethra, any necessary degree of pressure may be produced upon it, by turning the screw with which the cushion is connected. By means of this cushion
and

and screw, the pressure is chiefly confined to the urethra; so that the circulation is scarcely interrupted through the rest of the penis.

Fig. 2. A receptacle for the urine mentioned in page 169. It may be made either of tin or silver, or any other metal. It is somewhat convex on one side, with a concavity on the opposite side, by which it applies easily to the inside of the patient's thigh. *C D*, Two tubes for fixing two pieces of tape, by which, when the penis is put into the neck of the instrument, it may be tied to a circular bandage round the body; and the tube *F* serves to fix a piece of tape for tying the instrument round the thigh of the patient.

This instrument, when properly fitted, fits easily, and has frequently proved useful to patients who could not retain their urine, and with whom the jugum, for the reasons we have formerly enumerated, could not be employed.

A receptacle of this kind, of a size sufficient to contain three or four gills, may

be so adapted to the thigh as to admit of every necessary exercise.

Fig. 3. A bandage, originally invented by Mr Gooch, for retaining the rectum in cases of prolapsus ani. *F*, a plate of elastic steel covered with soft leather, which ought to be exactly fitted to the parts on which it rests; and the cushion *T* should be stuffed in such a manner as to produce an equal and easy pressure on being applied to the end of the gut after it is replaced. *G*, a strap to be fixed with a buckle on the fore-part of the body above the pubes; and *H H*, two straps connected with the upper part of the instrument, which, by passing over the shoulders, and being fixed by small knobs on each side of the buckle, serve to retain it exactly in its place.

PLATE XX.

[Opposite to page 168.]

Fig. 1. An Instrument mentioned in page 43. originally invented by Dr Butter, for injecting liquids into the bladder. *A A*, the handles of two thin plates of timber,

ber, which serve to compress a bladder placed between them, in which the liquor to be injected is contained. *B*, a stopcock of a pipe with which the bladder must be connected : And to the extremity of this short pipe a longer tube *C* is adapted, to be inserted into the urethra when the liquid is to be injected. Fig. 4. is a funnel for conveying the liquid into the bladder, by inserting the small extremity of it into the short pipe near to *B*, on the tube *C* being removed.

Fig. 2. and 3. Two pessaries for the purpose of supporting the prolapsed parts in case of a prolapsus uteri, and for compressing the urethra in cases of an incontinence of urine. Before being introduced, they should be well covered with any emollient ointment, or with sweet oil ; and they should be made to lie directly across the diameter of the vagina, so as to support the prolapsed parts as much as possible. These instruments may be made of any timber capable of receiving a fine polish : but much attention, we may re-

mark, is necessary to this circumstance; for unless they be made perfectly smooth, they cannot possibly be used. These pessaries, when a patient can admit of them, tend to support the relaxed parts better than any other; but even with the utmost attention to their being thoroughly polished, they frequently produce so much irritation as to become altogether inadmissible.

When pessaries of this kind cannot be employed, other inventions have been proposed. Pessaries composed of the *resina elastica*, are in general found to sit easily; and they commonly answer, for some time, the purpose of supporting the relaxed parts; but as they become soft and glutinous by long immersion in the natural mucus of the vagina, they soon lose that elasticity which a continued support of these parts requires. A piece of soft sponge being immersed in common glue, or in melted bees-wax, and kept in a compressed state till cold, being then cut into a proper form, and inserted into the vagina, commonly

commonly expands so much on the wax or glue melting, as to afford in most cases a very effectual and easy support to the relaxed parts: And in order to render the application of the sponge still more easy, it should be previously covered with a small bag of soft waxed linen, which prevents the sponge when it expands from fretting the sides of the vagina, which it is otherwise ready to do.

Pessaries of every kind, before being introduced, ought to have a piece of firm packthread or catgut tied to them, which by hanging out from the vagina, admits of their being more easily removed than they otherwise can be.

A great variety of instruments have been proposed by different authors for the purpose of preventing a prolapsus uteri; but these in general have been of a very complicated nature, and have never answered the purpose so easily as one or other of those we have now mentioned.

PLATE XXI.

[Opposite to page 184.]

Fig. 1. A trocar of a flat form, which may be introduced into the abdomen or scrotum with much ease, and with no risk to the contained parts. This instrument consists of a stilette or perforator, fig. 3. exactly adapted to the silver canula, fig. 2. The canula is laid open on one side, which admits of the perforator being broader through its whole length, as is represented in fig. 1. By this means an opening is made by the perforator, of a sufficient size for admitting the canula with much ease; and as the sides of the canula do not fall close together on the perforator being withdrawn, this instrument is not liable to an objection which has been adduced against the trocar of Mr Andrée, represented in Plate X. Vol. I. viz. there being some risk of the steel plates of which the canula of that instrument is composed doing some injury to the contents of the abdomen, on their falling together, which they do with some force on the perforator being withdrawn.

drawn. The instrument of which I now give a representation, is the invention of Mr Wallace surgeon in Glasgow.

Fig. 4. A trocar of a common triangular form, for the purpose of puncturing the bladder where this operation is necessary in cases of suppression of urine. The round or triangular form of this instrument renders it more proper for this operation than the trocars with lancet-points, as the fine points of these are not so well adapted for the different steps of the operation. And the groove in the perforator, by commencing at the point, and being continued through the whole of it, serves to point out with much certainty its entrance into the bladder; for the urine is observed to flow along this groove immediately on the point of it having entered the bladder.

Fig. 5. A flat silver canula, with a small degree of curvature for leaving in the opening after the operation for the empyema.

PLATE XXII.

[Opposite to page 345.]

Fig. 1. A bistoury with a probe of flexible silver joined to it. The curved bistoury with a blunt point, represented in Plate VII. Vol. I. answers exceedingly well in almost every case of fistula in ano; but as the addition of a silver probe has by many been considered as an improvement on this instrument, I have thought it right to give a representation of it.

Fig. 2. A bandage for the paracentesis of the abdomen, originally invented by the late Dr Monro. This bandage should be made of soft leather, lined with flannel. *A*, the body of the bandage, which should be of such a length as to pass from one os ilium, across the abdomen, to the other, to be there fixed by the straps *BBBB* to the buckles *CCCC*. The straps *DD*, by passing over the shoulders, serve to fix the buckles *EE*, which pass through between the thighs; and in this manner almost every part of the abdomen may be sufficiently compressed. When the operation of tapping

ping is to be performed, the bandage must be fixed in the manner we have now directed, care being taken to leave the window *F* open, exactly opposite to the part where the perforation is to be made; which for this purpose should be marked with ink. On the water being drawn all off, and a pledgit being applied upon the wound, the opening *F* may be shut by the straps *G* and the buckles *H*, as is represented by the letter *I*. In this manner, any necessary degree of pressure may be applied; which, after the operation of tapping, is a circumstance of much importance, and should never be omitted.

PLATE XXIII.

[Opposite to page 423.]

Fig. I. An instrument for fixing the canula after the operation of bronchotomy, described in p. 405, &c. *A*, a plate of thin polished steel, with a curvature corresponding to the anterior part of the neck. *BB*, the extremities of the plate *A*, with which the straps *CC* are connected, for the purpose

pose of fixing the instrument by means of a buckle on the back-part of the neck. *E*, a moveable frame, which should be made to pass easily up and down on the two perpendicular branches of polished steel *DD*, fixed to the inside of the plate *A*. In this frame there is an opening a little above *E*, for receiving the double canula represented by the inferior letter *F*. The letter *F* opposite to *E*, represents a small screw, which passes through the under-part of the frame; and by pressing upon the under-part of the canula, it thus serves to fix it exactly where it is placed after the operation.

As the frame is made to slide easily upon the two branches *DD*, and as the double canula *F* can be inserted to any depth in the trachea, and can be fixed, as we have said, by the screw passing through the under part of the frame, this instrument is accordingly found to answer every purpose expected from it. It is the invention of Dr Monroe, who in different cases has employed it with advantage.

Fig.

Fig. 2. The instrument mentioned in page 418. for perforating the trachea in performing the operation of bronchotomy. *G* the point of the perforator passing thro' the double canula *H*.

Fig. 3. A representation of the double canula unconnected with the perforator.

PLATE XXIV.

[Opposite to page 425.]

Fig. 1. An instrument, termed a Probang, for the purpose of pushing such substances into the stomach as are fixed in the œsophagus. It consists of a piece of soft sponge, firmly tied to a piece of flexible whalebone, fifteen or sixteen inches in length. The whalebone should be well polished; and in order to render the introduction of it as easy as possible, it ought to be well rubbed over with fine oil.

Fig. 2. A scarificator, for the purpose of opening abscesses in the fauces, or for scarifying the amygdalæ when in a state of inflammation.

Fig.

Fig. 3. The scarificator covered with a silver canula. *A*, the handle of the scarificator; *B*, a screw-nail fitted to the holes in the scarificator; by which the length of the point to be left uncovered at the extremity of the canula *C* may be exactly regulated.

END OF THE SECOND VOLUME.

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